

CHAPTER 4

FORMULATING AN OPERATIONS PLAN

An operations plan defines the specific program activities to be performed by management agency personnel. This specifies what functions (pertaining to design, installation, and maintenance of small wastewater systems) will be provided, how their functions will be carried out, and by whom. Much of the information presented in Chapter 3, "Selection of the Management Agency," is applied in the formulation of an operations plan.

The institutional issues involved in preparing an operations plan include:

1. Who will promulgate and enforce system design regulations?
2. Who will conduct site evaluations, prepare system designs, review design plans, and issue permits?
3. Who will ensure that systems are installed according to design?
4. Who will inspect system operations?
5. Who will pump out and dispose of septage wastes?
6. Who confirms that a system has failed and requires its repair?
7. Who performs continuing maintenance and repair?

Complementing technical issues which need to be addressed in preparing an operations plan, which are inputs to the institutional assessment, include:

1. What types of wastewater systems are to be applied?
2. What are the limits of the service area?
3. How will site evaluations be conducted?

4. What should the inspector do in reviewing:

- a. System design plans.
- b. System installations.
- c. Permit applications.

5. How often should septic systems and other types of wastewater systems be inspected?

6. How should residual wastes (e.g., septage) be disposed of, and where?

Moreover, the specific institutional requirements of a wastewater management program will depend on the scope of the program, as well as the applied technology. The level or scope of wastewater management programs will be determined on the basis of local needs, physical characteristics, and environmental sanitation and health objectives. The assessment of these complementing, yet diverse, management requirements will help prepare the framework for developing an operations plan.

GUIDE FOR OPERATIONS PLAN FORMULATION

This section of the chapter presents the major analysis steps to be conducted in selecting institutional options to carry out the system design, installation, and operation and maintenance functions, related to the operations plan. The discussion of analysis steps that follow apply to the preparation of an operations plan for both on-site and small community systems. Subsequent sections of this chapter will separate the discussion of management functions, i.e., design/installation and operation maintenance for both on-site and small community wastewater systems. In addition, the management of residual wastes is also addressed in the final section of this chapter.

The analysis steps involved in operations plan preparation include:

- Step 1 -- Establish management requirements for proposed wastewater technologies.

- a. Design/installation.
- b. Operation and maintenance.
- c. Residuals disposal.

- Step 2 -- Develop management alternatives.

- Step 3 -- Assess existing agency capabilities.

Step 4 -- Review of institutional options and alternative management approaches.

Step 5 -- Develop methods to enforce operations plan requirements.

Step 6 -- Recommend modifications to organizational structure and/or administrative activities to carry out operations plan activities.

These steps are described below.

Step 1: Establish management requirements for wastewater technologies.

- Design/installation
- Operation and maintenance
- Residuals disposal

The level of effort required to perform system design, operation and maintenance, and residuals disposal depends to a large extent on the complexity of the technology involved. Different kinds of design, operation and maintenance, and residual disposal activities are involved with different types of wastewater technology. The structure and organization of the management program should be sensitive to technological as well as political and economic factors.

The first step in developing an operations plan is to define the technical requirements of the wastewater systems under consideration, and to translate those requirements into a set of management functions. Tables 22 and 23 describe the functions that are typically involved in managing small wastewater systems. Table 22 lists the major management functions related to the preparation of an operations plan. The table should be viewed as a checklist of tasks which need to be performed within a management system. Table 23 displays broad categories of functions along with specific technology in matrix form. The user should first specify the form of technology being applied, and then identify applicable functions that need to be provided. Where additional detail in explaining functional requirements is necessary, the user may indicate the technical practices that define how the functions are to be carried out.

Step 2: Develop management alternatives.

The purpose of this task is to aggregate the requirements for wastewater system management into a set of management alternatives for institutional analysis.

The user should recognize that a particular wastewater approach may consist of various forms of technology. (Refer to the example analysis presented in Chapter 2.) The results of the previous step will yield an array of technologies and management requirements. The purpose of this step is to assemble the required management functions into a number of management alternatives (one or more sets of management alternatives for each technical alternative under consideration).

Table 24 offers several optional approaches for arranging system design and maintenance programs. These approaches are presented in a "building block" format, expressing a range of possible management approaches within the two functional areas. Therefore, it is possible to select one or more management approaches for further institutional analysis.

Step 3: Assess existing agency capabilities.

Once the management implications of various alternatives are displayed (as a result of Step 2), it will be necessary to examine and evaluate the capabilities of existing regulations and enforcement personnel in performing necessary functions. Modifications to management procedures, activities, or responsibilities can then be defined to accommodate technological requirements.

Coordination with the evaluation of technologies is important to help define the level of emphasis required by the management program in providing technology needs and objectives.

Tables 25 and 26 present a generalized procedure for assessing the adequacy of regulatory programs to fulfill management requirements. Data needs for analysis and evaluation criteria for determining the necessity for modifications to current institutional arrangements are shown in these tables.

Before conducting any detailed organizational and regulatory analyses, the user should review steps 1 through 4 of the Users Guide in Chapter 3, "Selection of Management Agencies."

Step 4: Review institutional options and management approaches for:

- Design/Installation
- Operation and maintenance
- Residuals disposal

The preceding evaluation should have pointed out strengths and weaknesses of the existing institutional framework to perform various management functions. The sections of the chapter that follow (i.e., Institutional Options) present descriptions of alternative institutional arrangements for conducting system designs, operation and maintenance, and residuals disposal. These alternative institutional arrangements should be reviewed and compared with the evaluation of the existing regulatory program.

Step 5: Develop methods of enforcing operations plan requirements.

Procedures for enforcing operations plan requirements are generally specified in codes and ordinances administered by a state or local agency. Fines, violation orders, permits, statements of noncompliance and injunctions are commonly used judicial and administrative techniques for complying with regulations, correcting failing systems, or upgrading substandard systems. Table 27 identifies several important techniques used to gain entry onto private property and to require periodic inspections and maintenance of wastewater systems. Obtaining this authority may be a specified condition of a Federal construction grant.

Step 6: Recommend modifications to organizational structure and/or administrative activities to carry out functions prescribed in the operations plan.

Table 28 is a checklist of management functions, with space provided to identify the preferred institutional arrangements, according to the operation plan analyses conducted in this chapter.

Any modifications to the existing institutional structure should be evaluated subject to the criteria set forth in Table 29. (See Tables 19 and 20 for sample evaluation criteria and rating formats.)

TABLE 22. FUNCTIONS AND RESPONSIBILITIES OF MANAGEMENT ORGANIZATIONS

<u>Planning/Administration</u>	
• O&M Plan preparation	M
- Wastewater facilities	-?
- Water supply/residuals disposal	-?
- Land use development	-?
• O&M Plan review coordination	M
- Interagency coordination to facilitate plan review	
- Integration of land use and wastewater management program needs and objectives	
- Plan review and approval	
• Research and development	C
- Feasibility study of alternative institutional arrangements	
- Cost-effectiveness analysis of alternative wastewater treatment and disposal technology	
• Office and staff management	C
- Establish office policies and procedures	
- Maintain sufficient staff size to accommodate workload	
<u>Site Evaluation</u>	
• Guidelines for performing site evaluation	
- Procedures and data requirements	-
- Licensing, certification, and training of site evaluators	- M (see below)
• Determination of site limitations	
- Site inspections	-
- Site testing and evaluations	- C
- Review and acceptance of findings	- M
<u>System Design</u>	
• Adopt system design standards	- M
- Performance standards and construction specifications	
- Licensing, certification, and training of system designers	
• Select and design system	- C
- Design assistance	
- Preparation of construction drawings and specifications	- M
• Design review and approval	
- Issue permits for system construction	
<u>Installation</u>	
• Establish procedures for system installation supervision	
- License, certify, and train system installers	-
- Determine number of site visits and procedures	-
• Final inspection and approval	M
- Issue occupancy permit	-
- Prepare as-built drawings	- C
- Maintain records	- M
<u>Operation and Maintenance (O&M)</u>	
• Establish O&M procedures and responsibilities	- M
- Develop program for routine O&M	- M
- Establish methods for conducting periodic inspections and evaluations of system operation	- M

TABLE 22. (CONTINUED)

• Develop enforcement and regulation mechanisms as required to conduct inspections and repair failed systems	- M
- Establish emergency maintenance procedures	- M
- Define characteristics of failing systems	- M
- License, train, and certify persons conducting inspections, minor repairs, and operating facilities	- M
• Operate and maintain facilities	
- Conduct routine and emergency inspections	
- Make repairs and replace defective systems and equipment	
- Supervise major repair/replacement work	
- Maintain records of inspections, maintenance, and repairs	
- Issue permit renewals and system performance certifications	
<u>Residuals Disposal</u>	
• Develop procedures for residuals treatment and disposal	- M
- Determine acceptable residuals treatment and disposal locations	- M
- License, certify, and train persons involved in residuals transport and treatment facility operation	- M
• Operate and maintain residuals disposal facilities	
- Develop reporting mechanism to identify origin, method and location of disposal, and volume of residuals disposal	- M
- Inspection of hauling equipment and treatment facilities	M
<u>Financing</u>	
• Determine available source of funding	M
- Apply for financial assistance	
- Secure funds for system construction and initial upgrading	
- Establish fee structure	
• Establish billing and collection mechanisms	M
- Charge fees for services rendered	
- Levy assessments	
- Monthly/annual billing and collection	
• Set and collect user charges and fees	M
- Finance debt service	
- Raise revenue for O&M	
<u>Monitoring</u>	
• Establish monitoring methods and evaluation criteria	M
- Develop plans and specifications	
- Develop compliance reporting system	
• Conduct environmental testing monitoring	
- Monitor groundwater quality	
- Monitor surface water quality	
- Report monitoring results	
<u>Public Education/Public Relations</u>	
• Develop educational programs and information transfer methods	C
- Define audience of education program	- M
- Determine most productive education methods	- C
- Develop method of reporting system failures	- M
• Inform public and program participants	
- Inform public of maintenance procedures, proper operation, and water conservation techniques	- M
- Disseminate information to professionals and contractors	- M
- Respond to inquiries, complaints, etc.	M



TECHNOLOGY/FUNCTI

ion System Installa-
Design tion

Individual Nondischarge
System

Individual Mechanical
Treatment Units

Individual Pumping
Units

Recycle Systems

Water Conserving
Systems

Holding Tank

Experimental
Individual Systems

Gravity Sewers

Low Pressure Sewers

Vacuum Sewers

Conventional Small
Community Treatment
Facility

Community Surface
Discharge

Innovative and
Alternative Small
Community Treatment
Facility

Community Subsurface
Disposal

Community Land
Application

SAMPLE FORMAT

TABLE 24. ALTERNATIVE APPROACHES TO SMALL SYSTEMS MANAGEMENT
-- BUILDING BLOCKS IN INSTITUTIONAL ANALYSIS

System Design--Installation

- Rely on existing state and local regulatory programs to govern the design and installation of wastewater systems.
- Supplement existing regulatory programs with training and certification programs to ensure the participation of qualified public and private sector personnel and to standardize the design-in-stallation process.
- Modify existing regulations to incorporate "best management practice" design standards to provide additional safeguards for system performance.
- Modify existing regulations to provide more thorough site reviews of individual lots and proposed subdivisions, and restrict the use of standard wastewater disposal systems to areas with optimum site conditions.

System Operation--Maintenance

- Rely on the homeowner to provide sufficient maintenance of his/her wastewater system.
- Supplement homeowner arrangement with educational programs to promote proper maintenance practices.
- Provide incentives for homeowner maintenance (of on-site systems) through the provision of accessible and inexpensive septage disposal facilities.
- Conduct routine inspections of new and existing wastewater systems as part of an areawide sanitary survey or pre-sale inspection.
- Mandatory maintenance provisions for both new and existing systems established by state or local regulatory programs (e.g., through maintenance permit provisions, certificates of compliance, or service contracts).¹
- Establish formal management programs governing the design, installation, and maintenance of wastewater systems. (Systems could be owned by the homeowner or by a public entity.)

¹See Table 27 for further explanation of these mandatory maintenance enforcement techniques.

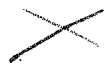


TABLE 25. DATA NEEDS FOR INSTITUTIONAL ANALYSIS

Organizational Analysis

1. Display the organizational structure of the regulatory program, noting responsibilities and authorities.
2. Determine number of agency staff assigned to wastewater management activities.
3. List responsibilities and qualifications of staff.
4. Assess time devoted (by staff persons) in performing the following duties:

• Design/installation

- Conducting site evaluations.
- Reviewing permit applications.
- Permit recording.
- Installation inspections.
- Recordkeeping of permits issued, as-built drawings, etc.
- Other design/installation activities.

• Operation and maintenance

- Routine inspections.
- Complaint inspections.
- Supervision of system repair/replacement.
- Other operation and maintenance activities.

• Residuals disposal

- Recordkeeping of septage pumpouts, failing systems, etc.
- Regulation of septage haulers and disposal sites.
- Water quality monitoring.
- Other residuals disposal activities.

5. Assess other administrative/regulatory issues:

- Total permit activity (permit applications reviewed and issued)
 - Daily average.
 - Monthly average.
 - Yearly average.

Regulatory Analysis

1. Assess adequacy of regulations to handle current and future wastewater problems.
 - Design standards, criteria, and general procedures.
 - Operation and maintenance rules and regulations.
 - Residuals disposal regulation.
2. Review procedures for modifying regulations.
 - Legislative actions.
 - Administrative actions.

TABLE 26. INSTITUTIONAL NEEDS ASSESSMENT ISSUES

• Organizational Analysis

- Are staff persons being utilized effectively?
- Are staff qualifications compatible with duties?
- Is sufficient time being spent on performing management activities?
- Can existing staff perform additional duties (i.e., operation and maintenance) or spend additional time on any single activity?
- Are private sector entities utilized in the current regulatory program?
- Are records of system installations, inspections, and septage pumping being accurately kept? Has the data been evaluated in an effort to improve the effectiveness of the management program?

• Regulatory Analysis

- Do the existing regulations and ordinances contain sufficient emphasis on site evaluation, system design, installation procedures, operation and maintenance, and residuals disposal?
- Have attempts been made to modify or update regulations in the past? What was the outcome?
- Can local regulations be changed? What is the state local arrangement for wastewater system regulation?

Property

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Identify specific management agency (i.e. special district, municipal authority, municipal government, county agencies, regional agencies, State agencies, Federal agencies, private organizations, and other groups) and indicate responsibilities of each agency.

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TABLE 29. EVALUATION CRITERIA FOR OPERATIONS PLAN FORMULATION

Administrative/Legal Feasibility

- Does sufficient legal authority exist to perform required operations plan activities?
- Are current staffing size and qualifications adequate?
- Are experienced private sector representatives being utilized to their fullest extent?
- Can the existing or proposed management entity respond to changing user needs? Is the entity able to cope with potential adverse reactions to the use of small wastewater systems?

Institutional Feasibility

- Does the management agency (either current or proposed) have the capability to accommodate institutional changes?
- Is there sufficient justification for expanded public agency involvement in operation and maintenance activities?
- Does the current state-local organizational structure permit institutional modifications to regulatory programs?
- Does a new agency need to be formed? Will this be politically acceptable?

INSTITUTIONAL OPTIONS RELATED TO SYSTEM DESIGN AND INSTALLATION

There are several types of institutions that carry out management activities for system design and installation. They include:

1. States.
2. Counties.
3. Cities, towns, villages, and townships.
4. Special purpose agencies.
5. Private individuals and companies.

Either singly or in combination, these institutional arrangements can be applied to carry out the following management functions associated with system design and installation:

1. Establish sanitary codes.
2. Conduct site evaluations.
3. Design small wastewater systems.
4. Review design proposals.
5. Issue installation permits.
6. Inspect system installations.
7. Prepare as-built drawings.
8. Issue occupancy permits.
9. License or certify system designers and installers.
10. Require performance bonds for installers and systems.

Table 30 provides a description of management functions and practices that are performed in designing and installing small wastewater systems, and generally identifies institutional options for implementation.

These functions can be carried out through various institutional arrangements. Functions associated with on-site system design/installation can be implemented through three broad institutional classifications:

1. State administration.
2. State-local administration.
3. Local government administration.

Institutional options for small community systems design/installation fall into two categories:

1. State administration.
2. State-local administration.

Several different approaches to implement these options are presented. Each description includes a sample arrangement of functional responsibilities and institutional options grouped

TABLE 30. DESCRIPTION OF DESIGN--INSTALLATION FUNCTIONS

Function	Description	Implementing Entity			
		State	County/Regional	Municipal	Special Purpose Agency Private Firms
Establish Sanitary Codes	Codes contain minimum standards for site evaluation, system design, construction procedures and materials.	•	•	•	•
Conduct Site Evaluations	Assess site conditions via hydraulic conductivity tests, soil borings, observation pits, and other tests to determine site suitability and select an applicable wastewater system.	•	•	•	•
System Design	Specify system type, location, and size. Design is typically based on criteria specified in sanitary codes.			•	•
Design Review	Evaluate information about the site and recommended design, upon which approval or disapproval can be made. Procedures for design review vary widely.	•	•	•	•
Permit Issuance	A fundamental regulatory procedure to enforce sanitary code provisions. Issuing a permit typically signifies that all conditions of the sanitary codes have been satisfied, and system installation can begin.	•	•	•	•
Installation Inspections	Visit site to ensure that the system is properly situated and sized, and ultimately, properly installed. Several visits may be necessary to adequately inspect a system.	•	•	•	•
As-Built Drawings	Prepared at the time of final installation inspection to document type, location, and size of the installed system, plus other pertinent data such as site evaluation results. Copies usually given to homeowner and filed by the permitting agency.	•	•	•	•
Issue Occupancy Permit	Official final approval of system installation; enables homeowner to assure occupancy. Can be revoked if system fails or if maintenance provisions are not complied with (e.g., maintenance permit provision).	•	•	•	•
Licensing and Certification of Designers/Installers	Require persons involved in system design and installation to pass a qualification exam, be registered to perform these activities, and/or be licensed. Certification and registration are typically voluntary mechanisms. Licensing can be an effective regulatory tool, if licenses are revoked if the performance of the licensed individual is not satisfactory.	•	•	•	
Bonding of Designers/Installers and Systems	Bonding can help protect the homeowner from substandard installation. System bonding can be required of the installer or manufacturer to reduce the burden of the homeowner in the event of system failure within a specified period of time.	•	•	•	•

according to the general categories listed. Supplemental information in the form of "illustrations" are also included to highlight different ways in which these institutional concepts have been implemented in actual situations. The information contained in these illustrations was derived from the Interim Study Report, "Management of On-Site and Small Community Systems," U.S. EPA, Municipal Environmental Research Laboratory, M687, November 1979, prepared by Roy F. Weston, Inc. The interim report documents the results of the earlier phase of this project--conducting case studies of state and local wastewater management programs. Subsequent chapters of this report are organized in a similar manner.

Regulating the Design and Installation of On-Site Systems

State Administration --

Under this arrangement, a state agency (e.g., a state health department or environmental protection agency) would promulgate and enforce statewide regulations governing individual systems. State-employed sanitarians (and other professionals) would administer a state code (and perhaps locally-adopted modifications to that code) governing the installation of all on-site systems within the state. The sanitarians would be stationed at a centralized location and possibly at regional field offices. Their duties would include site inspections, system design, technical assistance/public information, plan reviews, permit issuance, and installation supervision.

In order to improve system design and site evaluation efforts, specialists in soils analysis and system design may be required to provide technical assistance to persons contemplating the construction of on-site systems. Training, certification and licensing of system designers, site evaluators, and system installers by the state regulatory agency should also be considered. Table 31 displays the various roles a state agency can assume in on-site system design/installation. New Hampshire is one example of a state that has adopted this approach.

STATE ADMINISTRATION -- ON-SITE SYSTEMS ILLUSTRATION

The State of New Hampshire Water Supply and Pollution Control Commission (WSPCC) is an example of a state agency which has complete regulatory authority over the design and installation of on-site systems within the state. The state has prepared a detailed technical

TABLE 31. STATE ADMINISTRATION -- ON-SITE SYSTEMS

<u>Description:</u> A state agency with staff at central and regional locations would administer state sanitary code provisions, statewide.		
<u>MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:</u>		
	<u>Option 1</u>	<u>Option 2</u>
Establish Codes	State legislature or health board	State legislature or health board
Site Evaluation		
Soil testing	State sanitarian	Engineer/specialist ¹
Site inspections	State sanitarian	Engineer/specialist
System Design	State sanitarian or engineer/specialist	Engineer specialist ¹
Design Review	State sanitarian	State sanitarian
Installation Permit	State sanitarian	State sanitarian
System Installation	Property owner/developer	Property owner/developer
Installation Supervision	State sanitarian	State sanitarian
As-Built Drawings	State sanitarian	State sanitarian
Occupancy Permit	State sanitarian	State sanitarian
License Designers/Installers	State agency	State agency
Performance Bonding	State agency	State agency
<u>EVALUATION:</u>		
<u>Responsiveness:</u> May lack sufficient mobility and visibility to interact with general public. Depends on orientation to field office staffing.		
<u>Enforcement:</u> Can overcome difficulties that localities often have in proving strict code enforcement due to political pressures.		
<u>Sensitivity:</u> Major constraint is lack of flexibility and sensitivity with respect to local conditions and needs.		
<u>Staffing:</u> Has sufficient fiscal base and economies to provide qualified specialists to assist in plan review and approval; again, depends on field office orientation to become acquainted with local needs.		
<u>Coordination:</u> Potential exists for local governments to be insensitive and unresponsive toward public health and environmental concerns, if burden of on-site system review and approval is left totally with state agencies. Local land use plans and zoning ordinances need to be sensitive to wastewater management requirements.		
<u>Hired by property owner or developer.</u>		

STATE ADMINISTRATION -- ON-SITE SYSTEMS
ILLUSTRATION (CONTINUED)

manual that sets forth system design criteria, recommends site evaluation procedures, and minimum lot sizes, according to the type of soil and the proposed system size.

Regulation of on-site systems is administered by WSPCC at its central headquarters and four regional offices. The central office staff is responsible for reviewing plans, proposals, and system designs. The regional staff assist in this review by visiting the site before the system is installed, and then performing site inspections of precoverup installations, particularly at large subdivisions.

The WSPCC is currently considering the preparation of a detailed soils manual and a training and certification program for designers, and has initiated a series of seminars and workshops to help train persons performing soils evaluations and system designs. These latter programs are being considered in conjunction with a state exam and licensing program for soil evaluations.

State-Local Administration --

A variation of the previous approach is for the state regulatory agency to designate "agents" to administer state (or locally adopted) regulations. There are three basic ways the state agents approach can be organized (refer to Table 32):

1. State-employed agents can be contracted by local governments to administer locally-adopted on-site regulations (option 1). ✓
2. State-employed or certified agents, along with a local representative (e.g., local health officer), can administer on-site regulations (option 2). ✓
3. Local health departments or health officers can operate as "agents" of the state in enforcing state- or locally-adopted rules and regulations. (In this case all, part, or more of the local staff salaries may be paid by the state) (option 3). ✓

TABLE 32. STATE-LOCAL ADMINISTRATION -- ON-SITE SYSTEMS

TABLE 32. STATE-LOCAL ADMINISTRATION -- ON-SITE SYSTEMS				
<u>Description:</u> "State agents" working in conjunction with local agencies would provide the basis for a regulatory approach. There are three basic organizational arrangements for achieving a state-local cooperative approach.				
<u>MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:</u>				
	<u>Option 1</u>	<u>Option 2</u>	<u>Option 3</u>	
Establish Codes	State	State or local	State or local	
Site Evaluation				
Soil testing	Agent or engi- neer/specialist	Agent	Agent or engi- neer specialist	
Site inspections	Agent	Agent and local officials	Agent	
System Design	Agent or engi- neer specialist	Agent or engi- neer specialist	Agent or engi- neer specialist	
Design Review	Agent	Local official	Agent	
Installation Permit	Agent	Local official	Agent or local agency	
System Installation	Property owner/ developer	Property owner/ developer	Property owner/ developer	
Installation Supervision	Agent	Agent or local official	Agent	
As-Built Drawings	Agent	Agent or local official	Agent	
Occupancy Permit	Agent	Local official	Agent or local agency	
License Designers/ Installers	State	State	State or local	
Performance Bonding	State	State or local	State or local	
<u>EVALUATION:</u>				
<u>Responsiveness:</u>	Has great flexibility for achieving close interaction with the general public. Option 2 is exemplary in this respect due to the interaction with the local official.			
<u>Enforcement:</u>	Capacity to enforce regulations will depend largely on local support in all options, however, option 3 has some of the same enforcement effectiveness advantages as state administration. This option will help ensure uniform enforcement throughout a state or region.			
<u>Sensitivity:</u>	Through local involvement, sensitivity to local needs can be assured.			
<u>Staffing:</u>	Has the ability to provide "specialists" services to localities without a major local cost burden.			
<u>Coordination:</u>	Has the same potential for land use/wastewater management conflicts as the state administration approach, except for option 3, which has more local regulatory support.			
<u>Hired by property owner or developer (may be state-certified or licensed).</u>				

In option 1, state-certified agents would perform all necessary design/installation activities (with the possible exception of system design). In the second option, a state-certified agent would concentrate on site evaluation and system design activities, while the local representative would review the permit application, issue the permit, and inspect the system installation. Under option 3, local agents can be considered state employees, however, they would work in local regulatory agencies.

The state agent approach offers an opportunity for local governments to more actively participate in the on-site system regulatory process, without creating a significant burden on local fiscal resources. This approach is most applicable to small rural communities that do not have the fiscal capacity to support the services of a professional to administer locally adopted or state minimum on-site regulations. State agencies may also provide education, training, and licensing programs for these agents which will help to ensure competent and qualified technical assistance to local communities. (In some states where this approach is practiced, an agent must either pass a qualifying exam or be a professional in the field of soils science, geology, or engineering.)

Another application of this approach is for the review of subdivision plats proposing on-site systems. Even though a local agency may issue a permit to install an individual septic system, the state may reserve the right to review (and possibly approve/disapprove) subdivision plats that propose on-site systems. The precise structure of the state-local arrangement in reviewing subdivision plats and the permitting of individual on-site systems will differ state-to-state. For example, one possible arrangement is to separate the review and approval of subdivision plans from the review and approval of individual system applications. The respective reviews and approvals, therefore, would be conducted independently, possibly by different agencies. An alternative approach is to condition the issuance of an individual system permit with the approval of a subdivision plan. Thus, the subdivision plan approvals and the issuance of individual system permits could be done simultaneously.

Examples of states that have adopted "agent of the state"-type programs follow.

STATE-LOCAL ADMINISTRATION -- ON-SITE SYSTEMS
ILLUSTRATION

In Pennsylvania, the State Department of Environmental Resources (DER) has regulatory authority over individual and small community wastewater systems, but the on-site permitting program is administered by local governments through state-certified sewage enforcement officers (SEO). The approval authority for on-site systems rests totally with the SEO, whose salary is paid jointly by the DER and local governments. (The local share is raised partially through permit fees.) County sanitarians coordinate and assist the SEO's on technical matters.

The State of Maine Department of Human Services (DHS) is responsible for setting the minimum codes for small subsurface systems, which are enforced by certified and trained local agents (local plumbing inspectors -- LPI) employed by cities and towns. LPI's review and approve on-site system applications prepared by state-certified site evaluators.

The On-Site Specialists Program in the State of Vermont, initiated through the Vermont Association of Conservation Districts, represents a unique adaptation of the "agent-of-the-state" approach. On-site specialists, employed by the conservation districts, work for local health officers to administer locally adopted on-site regulations. Site evaluation, system design, and installation supervision are services offered by the on-site specialists to developers and local health officers. The specialists currently work in about 60 of the 250 towns in Vermont.

In Maryland and Virginia, county health agencies are principally responsible for regulating on-site systems, through adoption of a state minimum code or modification of the state code. County agency staff, however, are employees of the state government. They are responsible for enforcing locally-adopted codes, but are considered state employees. The regulatory procedures for administering design codes do, however, vary on a county-by-county basis.

Local Administration --

The third, and most popular, approach to administering on-site design regulations is for a local unit of government (county or township health department, regional health departments and special purpose agencies) to assume direct regulatory control over on-site systems. In these instances, the local government can prepare its own set of regulations or adopt (or modify) the state minimum regulations (if available).

The role of state government in a locally-administered program is variable. The state can:

1. Offer technical assistance to local regulatory agencies in reviewing subdivision plans and individual system applications.
2. Help to finance local programs through operating grants.
3. Hold workshops, seminars, and other instructional programs for system designers, site evaluators, system installers, and local sanitarians.
4. License and certify system designers, site evaluators, system installers, and local sanitarians.
5. Evaluate the performance of local regulatory programs and offer guidance in program administration.
6. Assume direct regulatory control for on-site systems installation in localities that do not have regulatory programs.
7. Supervise the administration of local regulatory programs through local permit reviews.
8. Issue approvals and permits for "experimental" or innovative on-site systems.
9. Assume responsibility for review of on-site system applications in certain situations (with authority to override local decisions).

As displayed in Table 33, there are a variety of ways in which local units of government can administer on-site regulations. The local regulatory agency can be a county or township agency (e.g., a health department), a special service district or other local government entity. The size and qualifications of the staff and the regulatory and administrative procedures followed by the local regulatory agency can differ widely even among agencies of similar institutional structure. The performance, policies, and size of local regulatory agency staffs will ultimately be affected by the fiscal and political support given to local regulatory programs from both state and local levels. Several examples of locally administered on-site management programs follow.

LOCAL ADMINISTRATION -- ON-SITE SYSTEMS
ILLUSTRATION

The state-local relationship for regulating on-site system design in the State of Illinois illustrates the typical organizational structure for this regulatory activity in most states which share regulatory responsibilities with local governments. The state minimum code for designing and installing on-site systems is administered by local (i.e., county and multicounty) health agencies. The local health agencies have the authority to adopt codes that are more stringent than the state minimum (with state approval). Local health agency procedures for conducting site evaluations and preparing system designs vary. The state, however, does license system installers. Some county health agencies have established more rigid installer requirements which are administered locally. County health departments are staffed to perform design reviews, pre-coverup system inspections, and occasionally site evaluations (or reviews of reported site investigations). The local programs are funded through locally-administered special assessments and general funds, and state transfer payments.

In parts of the state where county health departments do not exist (i.e., in sparsely-developed areas), the State Health Department regulates on-site systems installations, primarily through the licensing of system installers. The state promotes the formation of local regulatory programs, offers technical assistance

TABLE 33. LOCAL ADMINISTRATION -- ON-SITE SYSTEMS

Description: A local agency, a county or township agency, a special service agency, and multilocal or regional entities can become the principal regulatory agency for on-site system design/installation.

MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:

	Option 1	Option 2
Establish Codes	State or local	State or local
Site Evaluation		
Soil testing	Agency ¹	Engineer/specialist ²
Site inspections	Agency	Engineer/specialist
System Design	Agency	Engineer specialist
Design Review	Agency	Agency
Installation Permit Issuance	Agency	Agency
System Installation	Agency or property owner/developer	Agency or property owner/developer
Installation Supervision	Agency	Agency
As-Built Drawings	Agency	Agency
Occupancy Permit	State-sanitarian	State sanitarian
License Designers/Installers	Agency	State or agency
Performance Bonding	Agency	State or agency

EVALUATION:

Responsiveness: Exhibits great deal of responsiveness to local needs.

Enforcement: Potentially vulnerable to local political pressure. Regional (multicounty or multimunicipal) regulatory agencies may provide sufficient protection from political influences. Subject to wide variability in enforcement attitudes and effectiveness within a state. Option 1 creates a management agency with total responsibility for system design/installation.

Sensitivity: Standards and procedures can be established according to local physical and manmade conditions.

Staffing: Subject to wide variability in staff size and qualifications among local agencies.

Coordination: Provides efficient means of integrating land use and other local management objectives with wastewater management policies.

¹Refers to local agency, local health department, regional health agency, or special purpose agency.
²Hired by the developer (may be certified and/or bonded by state or local agency).

LOCAL ADMINISTRATION -- ON-SITE SYSTEMS ILLUSTRATION (CONTINUED)

to preestablished local programs and sponsors statewide seminars for local sanitarians, installers, and system designers.

The State of California does not have a minimum code, and local regulatory agencies (i.e., county, city, and special districts) implement locally derived and adopted codes. Each Regional Water Resources Control Board must review and approve on-site disposal ordinances for counties within its jurisdiction. The regional basin plan specifies minimum requirements for design of individual systems with which counties must comply. These requirements vary among the Regional Board, as well as among counties within a particular region.

The variation in design requirements among counties and regions reflects the state policy of establishing regulations according to unique local conditions.

Local county health departments work with the California State Health Department on some matters concerning on-site disposal. The State Health Department acts in an advisory capacity to those counties having a health department (46 out of California's 58 counties). For the 12 counties without health departments (rural counties with relatively low populations), the counties contract with the State Health Department to implement county-adopted on-site disposal ordinances. Ten state district health offices have environmental health units which provide technical support to counties on request or by contract.

In the State of Idaho counties (in cooperation with the state health agency) have formed regional health agencies to provide some insulation for plan reviewers from local political pressure and to establish design criteria consistent with unique regional climatic and physical conditions. This type of geographic arrangement also allows for a larger financial base to support agency efforts.

LOCAL ADMINISTRATION -- ON-SITE SYSTEMS ILLUSTRATION (CONTINUED)

States which have delegated regulatory authority to local units of government may wish to reserve its authority, when it is felt that a local entity is not doing a satisfactory job. Regulations drafted (but not yet effective) in Connecticut for example, would allow the State Department of Environmental Protection (DEP) to delegate authority over on-site wastewater disposal on an almost case-by-case basis, depending on the expertise of the individual locality. According to Connecticut regulations, candidates for state delegation include other state agencies and municipal or district health agencies.

It has been similarly proposed in the State of Wisconsin that the State Department of Health and Social Services evaluate each local (county) regulatory program (on the basis of installation permits issued) to check the effectiveness of local regulatory efforts. The state agency can suspend the local agency's authority to issue permits, if a local program is found to be ineffective, according to state review guidelines. (The State of Illinois Department of Health also conducts program reviews of county health departments to determine the amount of state aid for local regulatory programs.)

Stinson Beach, California, is an example of a community which has organized a comprehensive on-site management program, through a special district. The district has the authority to regulate new system installations (in conjunction with the Marin County Public Works Department), to rehabilitate and repair failing systems (through its own set of regulations), as well as to inspect and maintain both existing and new systems. The district is staffed by one full-time and one part-time technician. These persons are assisted by a consultant who reviews plans for rehabilitated systems; the county reviews plans for new installations.

Regulating the Design and Installation of Small Community Systems

State Administration --

States can delegate the authority for regulating individual on-site systems (serving a single residence) to local units of

government, but retain the responsibility for reviewing and approving small community systems (serving more than a minimum number of residences). Under this arrangement, the state agency has the option of:

1. Issuing a permit to construct the small community system (based on state review and approval) and inspecting its installation.
2. Delegating the authority for permit issuance and installation supervision to local units of government upon state review and approval (see Table 34).

This latter arrangement can be advantageous from an efficiency point of view (since local system inspectors may be able to visit the construction site more frequently than state-employed counterparts). This approach, however, may be unrealistic if the local inspectors have not been trained (and certified) or are not familiar with these types of systems. Examples of states taking this approach to small community system management include Maine, Pennsylvania, Vermont, and New Hampshire.

STATE ADMINISTRATION -- SMALL COMMUNITY SYSTEMS ILLUSTRATION

The State of Maine offers an example of a regulatory program where small community systems are approved by a state agency, with permit issuance authority retained by a local agent (or representative) of the state. According to the state plumbing code, all systems with wastewater flow greater than 3,000 gpd are reviewed and approved by the State Department of Human Services (Division of Health Engineering). Upon state approval, permits are issued by local plumbing inspectors (certified by the state agency), who are then charged with supervising system installation (with assistance from State Health Department staff). State-certified site evaluators (who are typically soil scientists and geologists) must perform site investigations, and a professional engineer must design the systems.

TABLE 34. STATE ADMINISTRATION -- SMALL COMMUNITY SYSTEMS

Description	
State agencies can assume responsibility for reviewing and approving small community wastewater system designs and issue permits for construction.	
MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:	
Establish codes	State
Site Evaluation	State
Soil testing Site inspections	Engineer/specialist ¹ State
System Design	Engineer/specialist
Design Review	State
Installation Permit Issuance	State or local
System Installation	Developer
Installation Supervision	State or local
As-Built Drawings	State or local
Occupancy Permit	State or local
Design/Installer Licensing	State
Performance Bonding	State
EVALUATION:	
Responsiveness	May enhance interaction with developers and local decision-makers on controversial projects.
Enforcement:	State has total authority to manage system design and installation.
Sensitivity:	State-developed design criteria could have sufficient flexibility to address major common problems.
Staffing:	Principal advantage of state approach is that experienced and qualified specialists can be staffed on a statewide level. Experiences can be derived by sharing review staff and common design criteria between the 201 Construction Grants Program and land development review and approval programs.
Coordination:	By relinquishing plan review and approval authority to a state agency (for new multiplot developments), local governments could partially lose control of the timing, location, and density of development within their jurisdiction.
¹ Qualifications of engineer/specialist would be defined in state regulations.	

STATE ADMINISTRATION -- SMALL COMMUNITY SYSTEMS ILLUSTRATION

Pennsylvania's Sewage Enforcement Officer (SEO) operates in much the same way with respect to the issuance of permits and plan reviews. In Pennsylvania, the state reviews and approves plans for all systems greater than 10,000 gpd (and for smaller systems upon request of the SEO), and the SEO then issues a permit for construction and inspects the installed system.

Pennsylvania also administers a subdivision evaluation and review requirement to coordinate plan reviews of major developments by state and local regulatory agencies.

In Vermont, the state has adopted regulations which require state review and approval for various types of small community wastewater systems in subdivisions where lots are less than 10 acres each. The state regulations provide for the evaluation of hydrogeologic and groundwater quality impacts (at the discretion of the state agency) where significant water pollution problems are suspected. The regulations also specify that a professional engineer must design small community systems, and where projects propose wastewater volumes greater than 10,000 gpd, a predesign conference between the engineer and state agency personnel must take place to discuss proposed design concepts.

New Hampshire's approach to the plan reviews of small community systems is an excellent example of state efforts to coordinate land development and 201 Facility Planning Program design review procedures. In this state, the review and approval of small community systems is the shared responsibility of the Small Systems Division (in charge of approving individual on-site system applications) and the Design Review Division (responsible for 201 plan review) within the New Hampshire Water Supply and Pollution Control Commission. The Design Review Division is typically looked upon as the specialists in small community systems, while the Small Systems Division is in charge of the wastewater plan review and permitting program for new developments in the state.

State-Local Administration --

As small community systems are more commonly proposed, local regulatory agencies are becoming more sophisticated and capable of handling the technical reviews. The regulation of small community systems design and installation has, therefore, shifted somewhat to local governments. The distinction between state and local responsibility is typically based on either the wastewater volume of the proposed system, the number of lots within the subdivision development, or whether the proposed system is a surface or subsurface discharge system. The precise delineation of regulatory authority differs from state-to-state. As shown in Figure 35, large wastewater systems and subdivisions are usually regulated by the state (option 1) while smaller systems and developments remain with local governments (option 2). Some states have chosen to provide technical support to selected local agencies (in addition to retaining regulatory authority in others) by delegating regulatory authority for small community systems to selected local governments on the basis of staff size and capability.

Combinations of state- and locally-administered programs are illustrated by the examples that follow.

STATE-LOCAL ADMINISTRATION -- SMALL COMMUNITY SYSTEMS ILLUSTRATION

In the State of Washington, local health departments regulate individual systems less than 3,500 gpd. Larger systems (up to 14,500 gpd) with subsurface disposal can also be regulated by the local health agencies or by the state health agency (depending on individual circumstances). Another state agency, the Department of Ecology, regulates all small community systems with flows greater than 14,500 gpd and all small community systems with surface-water discharge. The State Health Agency (Department of Health and Social Services) offers technical assistance to local health departments in their design review of small community systems.

In states like Maryland and Illinois, small community systems (with subsurface disposal) are regulated by the county health departments, with state agencies offering technical assistance or project reviews on a request basis. Small community systems with surface-water discharge, however, are regulated by the state.

TABLE 35. STATE-LOCAL ADMINISTRATION --
SMALL COMMUNITY SYSTEMS

Description: The regulation of small community system designs can be shared between state and local agencies through a threshold screening process.

MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:

	<u>Option 1</u>	<u>Option 2</u>
Establish Codes	State	State
Site Evaluation		
Soil testing Site inspections	Engineer/specialist State or local	Engineer/specialist Local
System Design	Engineer/specialist	Engineer/specialist
Design Review	State	Local
Installation Permit Issuance	State or local	Local
System Installation	Developer	Developer
Installation Supervision	State or local	Local
As-Built Drawings	State or local	Local
Occupancy Permit	State or local	Local
Designer/Installer Licensing	State or local	State or local
Performance Bonding	State or local	State or local

EVALUATION:

Responsiveness: Close working relationship between state agencies and local governments will help resolve and avoid any potential problems in dealing with the general public.

Enforcement: Adequate enforcement authority would exist for either state or local government agencies. A common problem with this approach is that a developer can choose which jurisdiction (state or local) he wishes to have review development proposals by simply adjusting the size of the development or wastewater system accordingly. Sometimes difficult to precisely define the capacity of some of the treatment units proposed.

Sensitivity: Standards and procedures could be flexible to handle difficult problems.

Staffing: Efficiencies can be achieved at state level, but some overlap exists.

Coordination: For new developments, many small scattered subdivisions could result if "Enforcement" problem above is applicable.

INSTITUTIONAL OPTIONS FOR OPERATION AND MAINTENANCE

The performance of any wastewater system is greatly affected by the attention given to the day-to-day operation and maintenance of the system. This is as true for an individual septic tank system in someone's backyard as it is for a large, expensive centralized collection and treatment system.

The activities involved in maintenance range from relatively simple routine maintenance tasks to the fairly complicated operation of treatment facilities requiring special experience and training. Many well-designed and well-constructed wastewater systems have failed because of improper operation and maintenance.

Table 36 displays the management functions and typical activities involved in system operation and maintenance. The list includes:

1. Establish operational performance standards.
2. Define system ownership.
3. Conduct routine maintenance.
4. Correct failing systems.
5. Educate homeowners in proper maintenance practices.
6. Monitor system performance via water quality sampling.

As shown in the table, these activities can be provided by a wide variety of institutional options. They can be administered by a public agency, a private contractor in conjunction with a public agency, a separate unit of government (a special purpose agency), or can be left to the homeowner. Selecting the appropriate agency or organization to provide maintenance services depends on the capabilities and the willingness of existing public agencies to provide such services and the availability of qualified private contractors. Moreover, the selection of the appropriate management agency is also influenced by the level or scope of maintenance services required for the specific situation. The level of desired management depends on the density of population, size of the development, physical characteristics at the development site, status of system ownership (i.e., whether the system is privately or

TABLE 36 DESCRIPTION OF OPERATION AND MAINTENANCE FUNCTIONS

Function	Description	Implementing Entity				
		State	County/Regional	Municipal	Special Purpose Agency	Private Firms
Establish Performance Standards	Providing guidance on maintenance and performance criteria. Can involve requirement for periodic inspections and maintenance.	•	•	•	•	
System Ownership	Establishing fiscal and legal responsibility for system maintenance and repair.		•	•	•	•
Routine Maintenance	Conducting periodic inspections of on-site and small community systems, and seepage pumping. Inspection frequency can be fixed at a defined time interval (e.g., 1 to 3 years) or limited to the time of home sale (e.g., presale inspections). Inspection provisions can also be tied to maintenance permit provisions. Seepage pumping can be done based on the system inspection, or required at a defined time interval (e.g., 3 to 5 years). Seepage haulers may be required to inform regulatory agencies of pumping events and disposal sites.		•	•	•	•
Correction of Failing Systems	Correcting a problem system involves: <ol style="list-style-type: none"> 1. Conducting inspections to determine the cause of failure and remedial action required. 2. Issuing a permit for system repair or replacement. 3. Performing the repair and replacement work. Enforcement methods to require system corrections include violation orders, citations for repair, and abatement charges. <p>Informing the homeowner of suggested or required maintenance practices.</p> <p>Water quality sampling and analysis to identify major quality problem areas where sanitary surveys may be necessary.</p>	•	•	•	•	•
Homeowner Education						
Monitoring						

publicly owned), and administrative requirements (e.g., EPA construction grants require management responsibility by the grantee).

Certain levels of management exist for providing operation and maintenance of individual systems, depending on the local situation and the involvement of existing regulatory agencies. These include programs which require inspections of individual systems, programs which provide specialized maintenance services to individual systems (such as seepage pumping), and programs which provide system maintenance in addition to design and installation services.

There are three basic programmatic approaches to providing operation and maintenance services to individual on-site systems. These three management schemes illustrate the variety of institutional arrangements that can be applied to the operation and maintenance function:

1. Maintenance by private (for profit and nonprofit) entities (subject to public agency rules).
2. Maintenance by a local unit of government.
3. Maintenance by a specialized management entity.

The operation and maintenance of small community systems can be provided through the following institutional options:

1. Maintenance by local units of government.
2. Maintenance by private utilities or companies.
3. Maintenance by specialized management entities
4. Maintenance by nonprofit corporations (e.g., property owners' association).

Alternative institutional approaches to the operation and maintenance of on-site and small community systems are discussed on the pages that follow.

Providing for the Operation and Maintenance of On-Site Systems
Maintenance by Private Entity --

The traditional approach to on-site maintenance is to leave the operation and maintenance responsibilities to the homeowner with public agency intervention where a problem is identified or suspected. Depending on local circumstances and the need for formal maintenance services, the homeowner can provide various system maintenance activities. For example, educational materials can be made available to homeowners to inform them of required system maintenance practices. Also, local septage disposal firms who perform this service in an acceptable manner could be managed by the public agency to assure pumping and safe disposal of septage at specified intervals, with a means of tracking and enforcement. Presale inspections and frequent sanitary surveys may also serve as preventive maintenance mechanisms where on-site systems are applied.

Table 37 displays two institutional options for homeowner maintenance. Option 1 places the responsibility for providing maintenance on the homeowner or family that uses the system. In option 2, a private hauler contracts with the homeowner (directly) or a property owners' association (as a group) for periodic maintenance services. In this latter case, the property owners' association would assess each homeowner a fee to cover the costs for periodic inspections and bill the homeowner separately for tank pumping.

A less direct method of assuring proper operation of on-site systems which should also be considered, involves enforcement of conservative, less operation and maintenance intensive, system design criteria. Thus, the management program, where formal maintenance provisions are difficult to enforce, would trade off increased capital costs due to conservative system design for reduced operation and maintenance costs. (It is assumed that even in these instances some form of maintenance, such as periodic septage pumping, would be necessary.)

An alternative method of ensuring proper maintenance would be for the regulatory agency to place the responsibility for system operation and performance on the builder (or installer) of the system in the form of a mandatory guarantee for a designated number of years. (Such a guarantee provision would be included in the sanitary code or ordinance.) The installer would have to repair malfunctioning systems free of charge during the guarantee period. Private homeowners would then be more interested in inspecting their systems periodically (or contracting

TABLE 37. HOMEOWNER MAINTENANCE -- ON-SITE SYSTEMS

Description: In certain instances, the homeowner may provide system operation and maintenance. This approach, however, would not satisfy the management agency requirement for Construction Grants Program eligibility, without enforceable provisions for compliance by the grantee.

MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:

	<u>Option 1</u>	<u>Option 2</u>
Establish Codes	State or local ¹	State or local ¹
System Ownership	Homeowner	Homeowner
Routine Maintenance		
Inspections	Homeowner ²	Private hauler ³
Septage pumping	Private hauler	Private hauler
Correction of Failing Systems		
Inspections	State or local	State or local
Permit issuance	State or local	State or local
System repair/replacement	Homeowner	Homeowner
Homeowner Education	State or local	State or local
Monitoring	State or local	State or local

EVALUATION:

Responsiveness: The homeowner would be able to take immediate measures to correct a problem if aware of the consequences of no action.

Enforcement: Indirect enforcement of operation and maintenance is needed, since this approach relies on voluntary compliance. The existing regulatory agency would assure that failing systems are corrected and that the homeowners comply.

Sensitivity: A program like this can be beneficial in sparsely developed areas, or in developing areas as a preventive measure.

Staffing: Additional staffing requirements of the responsible public agency is minimal.

Coordination: Program implementation rests predominantly with the homeowner and the willingness of state and local government and private haulers to make information available and assure adequate septage disposal sites.

¹Appropriate state or local regulatory agency.

²Routine inspections are not mandatory. The homeowner can inspect the system himself, or a presale inspection by a local agency can be performed as a service to a mortgage-lending institution.

³Private hauler would contract with the homeowner directly or with a homeowners' association.

with a private firm to inspect the system), and a penalty would be assessed the builder if the design and construction of the system was not satisfactorily performed. Possibly, a performance bond would be useful in this approach.

Many layman-oriented manuals explaining proper maintenance practices have been prepared for state and local agencies throughout the country. Copies of such documents are usually made available through various public agencies to successful permit applicants or by the contractor at the time on-site systems are installed. Other types of programs which complement the homeowner maintenance approach are illustrated in the examples that follow.

HOMEOWNER MAINTENANCE -- ON-SITE SYSTEMS ILLUSTRATION

Presale inspections of on-site systems are conducted in Fairfax County, Virginia, at the request of the lending institution. The cost to the homeowner for such services is \$25. The Minnesota Pollution Control Agency has been working with the Federal Housing Administration and the Veterans Administration to base mortgage approvals for existing homes on a certified on-site disposal system (through presale inspection).

Sanitary surveys are a means of identifying problem septic systems to complement homeowner maintenance activities. The surveys are performed by a variety of agencies, including state and local regulatory agencies, and property owners' associations. The State of Vermont Agency of Environmental Conservation conducts statewide sanitary surveys to identify failing on-site systems or inadequately designed on-site systems (e.g., straight-pipe discharges) near surface-water bodies. The annual surveys are conducted with state-employed water resource investigators. Many lake property associations and other watershed management entities have also taken on the responsibility of conducting sanitary surveys, using volunteers or students (during summer months). Methods of organizing lake property associations to perform problem detection activities and other duties have been developed in Wisconsin, Michigan, and California. In Maine, the Cobassee Watershed District conducted a detailed sanitary survey of lakefront septic systems to detect system failures. Similar sanitary surveys are being organized through the Maine Congress of Lake Associations.

HOMEOWNER MAINTENANCE -- ON-SITE SYSTEMS ILLUSTRATION (CONTINUED)

The septic system management programs of Acton, Massachusetts, and Fairfax County, Virginia, highlight the potential role of public entities in supplementing the potential role of disposal facilities, encourage homeowners to voluntarily maintain their septic systems. The Fairfax County Health Department also mails out reminders to homeowners to turn the diversion valves on their alternating drainfields. Similarly, in Stinson Beach, California, risers for all on-site systems (both new and existing) in the community must be installed to facilitate inspection and pumping. Detailed drawings noting the location, dimensions, and condition of all on-site systems are also left with the property owner to facilitate maintenance and promote property owner awareness.

Maintenance by Local Government

Counties, towns, and multilocal agencies can provide on-site system operation and maintenance. These services would be provided through a statutory requirement for periodic inspections or septicage pumping. The mandatory inspections could be performed by a public agency or a private firm. In either case, the homeowner would be responsible for making system repairs and paying for the maintenance services provided.

If mandatory inspections are performed by a public agency (option 1 in Table 38), the inspection workload can be shared by the entire agency staff, or a separate inspection unit can be established within the agency, depending on the agency's organizational structure and manpower commitments. The former method offers an opportunity to coordinate individual system inspections with other complementary agency duties, and offers staff persons a means of monitoring the effectiveness of the regulatory program. A separate specialists and afford greater control over the inspection procedures. At the time of system inspection, the public agency representative can determine if tank pumping or other maintenance or repair activity is necessary. The agency could perform the tank pumping or make repairs

TABLE 38. LOCAL UNITS OF GOVERNMENT -- ON-SITE SYSTEMS

Description: State or local ordinances can require periodic inspection or pumping of septic systems. Local units of government can provide these services. The private sector also has a potential role.

MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:

	<u>Option 1</u>	<u>Option 2</u>	<u>Option 3</u>
Performance Standards	State or local	State or local	State or local
System Ownership	Homeowner	Homeowner	Homeowner
Routine Maintenance			
Inspections	Local	Private hauler ¹	N.A. Local or private
Septage pumping	Local	Private hauler	
Correction of Failing Systems	Local	Local	Local
Inspections	Local	Local	Local
Permit issuance	Local	Local	Local
System repair/replacement	Homeowner	Homeowner	Homeowner
	State or local	State or local	State or local
Homeowner Education	State or local	State or local	State or local
Monitoring			

EVALUATION:

Responsiveness:

A private hauler contracted by a homeowner would probably be the most responsive to the homeowner's needs and problems. By requiring inspections (done by either a public or private entity) the homeowner's concerns be dealt with at fixed intervals.

Enforcement:

The local agency must have legal access to private property for inspection purposes for option 1. The local agency must also be able to require system corrections.

Sensitivity:

These different arrangements allow flexibility for management depending on need, as well as available resources.

Staffing:

Options 1 and 2 (or to a lesser extent, option 3) require additional staff to public agency staff, depending on the frequency of inspections to be served and the frequency of inspections.

Coordination:

Public and private sector representatives need to develop effective cooperative mechanisms to assure successful application of most of the options presented.

Private hauler contracted by either local agency or homeowner to perform periodic inspections.
Inspections are not explicitly required; only the pumping of septage at a prescribed frequency.

itself (and bill the homeowner accordingly), or require the homeowner to contract with a private septage hauler or septic system cleaner.

If mandatory inspections or periodic pumping were performed by a private company (options 2 and 3 in Table 38), a proof of inspection and required service statement would be forwarded to the regulatory agency. Should repair or replacement of the system be required, a regulatory agent should be notified to perform an inspection and recommend repair procedures. Where maintenance contracts with private companies are required, as is the case with proprietary mechanical on-site systems, the regulatory agency can check whether required maintenance contracts are being renewed by having the maintenance companies send the public agency notices of nonrenewals.

When involving the private sector in a mandatory maintenance program as just outlined, certain precautions should be taken:

1. Some assurances should be made (by the local agency) that only competent firms are involved in the program, and that a fair and equitable price is charged for inspections and pumping services performed. (Issuing franchise privileges or contracting directly with private firms will enable the local agency to ensure uniform service and prices.) Other possible approaches the public agency can take in protecting the homeowner from poorly qualified or overpriced contractors, would be to periodically publish the average quoted prices of the contractors serving the area, or to create a grievance board comprised of public officials, agency directors, and contractors to hear homeowner complaints.
2. There may be a tendency (on the part of private haulers) to perform unnecessary pumping or system repairs. Close monitoring of the competence of the service companies (through licensing, etc.), coupled with an educational program for homeowners (to inform them of proper maintenance practices) will help avoid problems such as this.

The participation of private septage haulers in a mandatory public maintenance program does, however, have the distinct advantage of alleviating legal and fiscal burdens on the local

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governing agency. Private sector participation in an on-site system maintenance program should, therefore, be given serious consideration by maintenance program designers.

Several local governments in the State of California have instituted different approaches to providing on-site operation and maintenance.

LOCAL UNITS OF GOVERNMENT -- ON-SITE SYSTEMS
ILLUSTRATION

Several California counties have instituted septic system inspection and maintenance programs. The Marin County Health Department has established an on-site system maintenance requirement through the use of an occupancy permit. The permit is effective for two years from the time of installation, and must be renewed at two-year intervals. The cost of the inspection and renewal is \$40 (or \$20 per year).

The procedure for performing the inspection (in Marin County) is straightforward. A county health agent mails a letter to the homeowner reminding him to have his tank inspected. An inspection is scheduled and performed by the county agent in the presence of the homeowner (or representative). If the system is operating satisfactorily, the permit is renewed. Should repair or pumping be required, the homeowner must submit proof of repair or pumping before the permit is renewed (pumping would be performed by a private septage hauler). The inspection program applies only to on-site systems installed pursuant to the county sanitary code, adopted in 1971.

In Kern County, California several county service areas have been established where special on-site system maintenance procedures are required. In these county service areas, the County Department of Public Works conducts the system inspections and pumps the tanks, if necessary.

Santa Cruz County, California, is an example of a county regulatory program that requires periodic inspections as a provision of its sanitary code. County Health Department maintenance permit provisions at two county service areas are implemented largely through the efforts of an independent contractor certified by

LOCAL UNITS OF GOVERNMENT -- ON-SITE SYSTEMS
ILLUSTRATION (CONTINUED)

the County Health Department and hired by the County Board of Supervisors. According to regulations adopted by the Santa Cruz County Health Services Agency, subdivision developers must dedicate easements to each lot for inspection, maintenance, and expansion, and septic tanks must be pumped out once every three years.

Maintenance by Specialized Management Agency --

Much of the literature on the topic of on-site system maintenance discusses the viability of a "total management concept." Experts in the field of wastewater management have suggested that on-site systems be maintained by a centralized management entity, similar to a sewer utility. This management entity could be responsible for providing all major functions related to wastewater management, including system design, installation, and operation and maintenance. Expanded approaches to the total management concept would involve actual ownership of the individual septic systems by the management entity. The service area of the entity would also be flexible and subject to the enabling legislation of the particular state.

The management entity could be formed through special purpose agency legislation or a local government (e.g., a local improvement district or department of a local government agency). Special purpose agencies generally have been viewed as the primary means of establishing a "total management" program. While the institutional approach has its advantages, an often cited disadvantage of the special purpose agency (and of "total management" programs) is that it promotes the proliferation of local government and the fragmentation of public services. Total management is not necessarily the most feasible or necessary approach in all situations. It does have numerous advantages, which have to be weighed with the need for such a formalized approach.

Table 39 presents the institutional options available to implement the "total management" concept. The basic difference among the three options listed is the system ownership arrangement -- either public or private ownership. Several examples of such programs follow.

TABLE 39. TOTAL MANAGEMENT CONCEPT -- ON-SITE SYSTEMS

Description: An appealing approach to providing on-site systems management is through the creation of a single, comprehensive management program to design, install, operate, inspect, and maintain on-site wastewater systems.

MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:

	Option 1	Option 2	Option 3
Performance Standards	State or agency ¹	State or agency	State or agency
System Ownership	Agency	Homeowner	Agency or homeowner
Routine Maintenance			
Inspections	Agency	Agency	Homeowner or private hauler
Septage pumping	Agency	Agency or private hauler	Private hauler
Correction of Failing Systems			
Inspections	Agency	Agency	Agency
Permit Issuance	Agency	Agency	Agency
System repair/Replacement	Agency	Homeowner	Agency or homeowner
Homeowner Education	Agency	Agency	Agency
Monitoring	State or agency	State or agency	State or agency

EVALUATION:

Responsiveness:

Local agency would be concerned with providing rapid service to investigate homeowner complaints, particularly if the agency owned the individual system. Homeowners, however, may be less likely to become concerned with proper system operation, since the local agency owns and operates the individual system.

Enforcement:

A total management agency would need sufficient capability to enter onto private property, perform maintenance, and regulate system repair or replacement. Special enabling legislation may be necessary to create management entities of this type.

Sensitivity:

The total management concept is flexible enough to meet local needs.

Staffing:

The use of private sector representatives could help reduce the staffing burden to public agencies. Can share management authority with existing regulatory agencies to avoid duplication of staff.

Coordination:

Proper coordination with planning and zoning entities would be necessary to assure that the continued use of individual on-site systems would not pose serious water quality problems.

¹Refers to a specialized local management agency.

TOTAL MANAGEMENT CONCEPT -- ON-SITE SYSTEMS
ILLUSTRATION

The Stinson Beach County Water District (SBCWD) and the Georgetown Divide Public Utility District (GDPUD) are two California on-site wastewater management districts organized as special purpose agencies. The SBCWD district was designed to provide maintenance services for existing and newly constructed on-site systems since January 1978. The GDPUD is also responsible for maintaining on-site systems; however, this management program started at the initial stages of a large residential subdivision, thus, few preexisting on-site systems came under its jurisdiction. Both the SBCWD and GDPUD provide for site design, installation, financing, and other supportive management activities in addition to operation and maintenance.

Another interesting feature of these management programs is the method used to enforce maintenance requirements. The SBCWD applies a maintenance permit-type approach, with inspection and renewal provisions. The GDPUD utilizes the service agreement concept, whereby a home buyer signs an agreement giving the district the authority to perform all necessary operation and maintenance duties. The nuisance abatement provisions of the appropriate county health agencies, supplemented by fines, liens, and injunctions provide these districts with the necessary enforcement tools.

Neither agency owns the individual on-site systems; system ownership remains with the homeowner in both cases. Therefore, where an inspection reveals a failed system or pumping requirement, a violation notice is issued and put on record (making it difficult to sell the home). The homeowner is liable for all costs of repair or pumping. If the homeowner does not perform the required repairs or pumping, the district (SBCWD or GDPUD) will undertake the work for him and bill the homeowner accordingly. Statutory provision in both cases has been made which requires the amount owed the agency to become a lien on the property.

The State of Washington has a requirement for permanent maintenance of on-site systems in certain subdivisions by an approved management entity. According to the state regulations, when subdivisions or

WFA: OSM need on density of subdivision so Q New development

TOTAL MANAGEMENT CONCEPT -- ON-SITE SYSTEMS
ILLUSTRATION (CONTINUED)

multiple housing units have gross densities exceeding 3.5 housing units or 12 people per acre, or waste flows of 1,200 gallons per acre per day, on-site systems will not be permitted unless permanent maintenance is provided. Eligible management entities include public agencies such as county agencies, as well as special service agencies such as sewer and water utilities and special districts. If no public agency is able or willing to operate a management program of this type, a special management corporation may be organized to serve as the management agency. A third party agreement with a public agency is necessary, if a private management entity is to provide maintenance services.

The states of California and Illinois, along with others, have recognized potential problems associated with the use of special purpose agencies (as management entities) and have incorporated explicit requirements within current enabling legislation to avoid the problem of proliferation of local government or promotion of suburban sprawl. In order for an on-site wastewater disposal zone (a special purpose district) to be formed in California the County Environmental Health Agency and the Regional Water Quality Control Board must determine the maximum number, type, volume, and location of on-site systems to be used within the zone without threatening health or water quality. According to Illinois enabling legislation, an on-site wastewater management zone can only be formed within the limits of an incorporated area or municipality. Several other states have also passed similar enabling legislation.

California
Sewer - use
in districts

California
Illinois
Restrictions

Providing for the Operation and Maintenance of Small Community Systems

Maintenance by Local Governments --

Small community systems can be owned, operated, and maintained by local units of government -- counties, towns, villages, etc. Table 40 shows the various options available in system ownership, maintenance, and operation. As presented in the table, the municipality can provide maintenance services on a contract basis to developers or property owners' associations,

TABLE 40. LOCAL UNITS OF GOVERNMENT --
SMALL COMMUNITY SYSTEMS

Description:	MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:		
	Option 1	Option 2	Option 3
A municipality can assume ownership and/or operation of small community systems within its jurisdiction.			
Performance Standards	State or local	State or local	State or local
System Ownership	Local	Private	Local or private
Routine Maintenance			
Inspections	Local	Local	Private contractor
Septage pumping	Local	Local	Private contractor
Correction of Failing Systems			
Inspections	Local	Local	Private contractor
Permit issuance	Local	Local	Local
System repair/replacement	Local	Local	Private contractor
Homeowner Education	Local	Local	Local
Monitoring	State or local	State or local	State or local
EVALUATION:			
Responsiveness:	Provides opportunity for immediate attention by local government, especially if system is publicly owned.		
Enforcement:	Most state enabling legislation authorizes counties and municipalities to own, operate, and maintain small community sewerage systems.		
Sensitivity:	A public agency (such as a county) can provide operation and maintenance services to several systems within its jurisdiction.		
Staffing:	Public agencies can utilize other personnel to provide maintenance-related services to area sewerage systems.		
Coordination:	Integration of land use and wastewater management objectives can be achieved.		
Private ownership can be through a developer or property owners' association.			

or can own and operate the system itself. Many municipalities have imposed special design and performance requirements on systems it intends to own or operate. As an example:

LOCAL UNITS OF GOVERNMENT -- SMALL COMMUNITY SYSTEMS
ILLUSTRATION

In the State of Washington, departments of public works in several counties are providing operation and maintenance services for community septic tank-drain fields at subdivision developments. Maintenance (in the form of periodic pumping, drain field inspections and repair) is provided on a contract basis to homeowner associations, and developers as a part of municipally-operated maintenance services for systems dedicated to the municipality. One of the Washington counties (Kitsap County) which provides maintenance to community systems has established specific design criteria and construction specifications which must be adhered to before it assumes ownership or maintenance of these systems.

The state is currently promoting the use of municipal agencies to manage these small community systems, and is pursuing the concept of "satellite support systems" to provide maintenance to these scattered community systems. In a technical assistance role, the State of Washington Department of Social and Health Services has also been involved in conducting research on performance characteristics of community septic systems as a means of updating system design requirements and maintenance procedures.

Maintenance by Private Companies or Contractors --

Private utility companies can own and operate small community systems. Private contractors (e.g., plumbers, septic tank pumpers, etc.) could also become involved in providing operation and maintenance services on a contractual basis with developers, homeowners' associations, and public agencies (see Table 41). Private contractors and utilities can service a large area, and are not limited by political boundaries (except for the fulfillment of licensing, registration, or franchise service requirements by state and local regulatory agencies). This approach to small community system operation and maintenance is illustrated by the examples that follow.

TABLE 41. PRIVATE COMPANIES -- SMALL COMMUNITY SYSTEMS

<u>Description:</u> Privately-owned utilities or contractors could own and operate small community systems.	<u>MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:</u>	
	<u>Option 1</u>	<u>Option 2</u>
Performance Standards	State or local	State or local
System Ownership	Private company	Local or homeowners' association
Routine Maintenance		
Inspections	Private company	Private company
Septage pumping	Private company	Private company
Correction of Failing Systems		
Inspections	Private company	Private company
Permit issuance	State or local	State or local
System repair/replacement	Private company	Private company
Homeowner Education	Private company	Private company
Monitoring	Private company	State or local

<u>EVALUATION:</u>	
<u>Responsiveness:</u>	Private companies would generally be very responsive to customer needs and problems.
<u>Enforcement:</u>	Local governments may need to provide supporting legal and enforcement assistance to require connections to the sewerage system and to assist in fee collection. State public service commissions may be involved in approving rate changes.
<u>Sensitivity:</u>	The local governing agency should be primarily responsible for delineating franchise areas.
<u>Staffing:</u>	Private companies would relieve the burden on public agencies of providing qualified technical staff.
<u>Coordination:</u>	This is primarily a function of local governing bodies.

PRIVATE COMPANIES -- SMALL COMMUNITY SYSTEMS ILLUSTRATION

Most manufacturers of sewerage devices (e.g., grinder and effluent pumps, package treatment plants, etc.) offer maintenance contracts or guaranteed maintenance services to consumers. One large private development near Schenectady, New York (which has a pressure sewer collection system) uses the services of a grinder pump manufacturer located nearby to repair or replace pumping units. Another small town near Kansas City, Missouri (Weatherby Lake) employs technicians (from a nearby airplane manufacturing plant) to service pump units on a part-time basis. These two examples illustrate not only the role of the private contractor to perform services on an "as needed" basis, but point out the importance of the availability of experienced maintenance personnel to ensure long-term systems operation.

In southern Florida, the General Development Utilities, Inc. (GDU) owns and operates conventional wastewater treatment facilities and water supply systems serving communities built by the General Development Corporation (GDC), a large land development corporation. Since 1971, GDU has been serving parts of two GDC-developed communities with septic tank-effluent pump (STEP) systems. Maintenance and administrative personnel are (to some extent) involved in both the management of the pressure sewer system and conventional wastewater facilities.

Many regulatory agencies are reluctant to rely on private utilities or private contractors to maintain wastewater systems because of concerns over the financial stability of the private firms. Local governments are particularly worried that they will have to take over the ownership and maintenance of wastewater systems abandoned by bankrupt companies. The public agency should require some assurances that the private company can financially provide the needed service or own and operate the wastewater system on a permanent basis. Regulatory agencies should, therefore, be concerned with the following items before allowing a private company to own and operate a small community wastewater system:

1. Corporate structure and by-laws
2. Financial solvency (a state public utility commission should audit the firm).
3. Sponsorship (or trusteeship) by a public agency or recognized private corporation in the event a transfer of ownership is necessary.
4. Performance bonding for a time period adequate to begin system operation.

Enforcement of maintenance and reporting requirements by regulatory agencies is also important to assure satisfactory long-term system operation.

Maintenance by Special Purpose Agencies --

Maintenance of small wastewater systems by special purpose agencies (e.g., sanitary districts, sewer authorities, sewer districts, etc.) is a widely-used institutional approach, because of the flexibility of this type of arrangement. Special purpose agencies can be established by a municipality or by resolution of residents within the service area (depending on state enabling legislation). Generally, special purpose agencies have the powers to own, operate, and maintain wastewater facilities, and to finance their construction and operation.

Table 42 displays three options for providing operation and maintenance of small community systems. Two examples of special purpose agencies follow.

SPECIAL PURPOSE AGENCY -- SMALL COMMUNITY SYSTEMS ILLUSTRATION

Lake Meade, Pennsylvania is one of many examples of lakefront communities across the country that have installed grinder pump/pressure sewer systems for wastewater collection. The lake community (which is situated in part of two municipalities) consists of about 300 homes. The Lake Meade Municipal Authority (LMMA) owns and maintains the pressure sewer system and treatment plant, and installs all grinder pumping units.

The LMMA and a utility easement were created by the developer and sponsoring municipalities in the late 1960's. The initial planning for sewerage service for

TABLE 42. SPECIAL PURPOSE AGENCY -- SMALL COMMUNITY SYSTEMS			
Description: Special purpose agencies offer a convenient means of managing small community systems.			
MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:			
	Option 1	Option 2	Option 3
Performance Standards	State or local	State or local	State or local
System Ownership	Agency ¹	Homeowner	Homeowner
Routine Maintenance			
Inspections	Agency	Agency	Private contractor ²
Septage pumping	Agency	Agency	Private contractor ²
Correction of Failing Systems			
Inspections	Agency	Agency	Private contractor
Permit issuance	State or local	State/local/agency	Agency
System repair/replacement	Agency	Agency	Private contractor
Homeowner Education	Agency	Agency	Agency
Monitoring	Agency	Agency	Agency
EVALUATION:			
Responsiveness: The responsiveness of this institutional arrangement will depend on the representativeness and access of the agency's governing board to the general public.			
Enforcement: Generally special purpose agencies have the necessary powers to operate and maintain small wastewater systems.			
Sensitivity: Special purpose agencies can be created to serve broad areas, e.g., individual municipalities, groups of municipalities, or parts of municipalities, thereby serving only the areas of greatest need.			
Staffing: Technical staff can be made available through agreements with local governments or with private contractors.			
Coordination: Local governments should provide the necessary coordination with other on-going public service programs.			
Special purpose agency.			
Private contractor hired by the homeowner or the special purpose agency.			

SPECIAL PURPOSE AGENCY -- SMALL COMMUNITY SYSTEMS
ILLUSTRATION (CONTINUED)

the lake community began in the mid-1970's, and operation of the treatment plant and collection system started in 1977.

The LMMA employs one full-time and one part-time treatment plant operator-technician to manage the sewerage system (i.e., pump and collection system maintenance, and plant operation).

In Westboro, Wisconsin, a septic tank/small diameter gravity sewer system and community drain field were installed in the mid 1970's as a result of widespread septic system failures in this small town. A sanitary district was formed to inspect and maintain the septic systems and drain fields and to regulate the design of individual septic tanks required at each home. The district now owns the individual septic tanks, gravity sewer lines, and community drain fields. Ownership of the existing septic tanks was acquired through an easement (i.e., a transfer of ownership from the homeowner to the district at a nominal fee).

Maintenance by Nonprofit Organizations --

A homeowners' association or some form of resident cooperative may be the only organization available to assume operation and maintenance responsibilities for small community systems. (This may be particularly true in rural areas.) With a sufficient legal framework (see the Chapter 3 discussion on nonprofit corporations), these organizations can provide an adequate mechanism for system ownership, user fee assessment and collection, and system maintenance, where allowable.

Table 43 displays two options for providing operation and maintenance through nonprofit organizations. These options are:

1. By contract to outside firms.
2. By hiring a staff or by the members themselves.

An example of a nonprofit private management program is Otter Tail County, Minnesota.

TABLE 43. NONPROFIT CORPORATION -- SMALL COMMUNITY SYSTEMS

<u>Description:</u> A rural cooperative, homeowners' association, or other nonprofit organization could own, operate, and maintain small community systems.		
<u>MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:</u>		
	<u>Option 1</u>	<u>Option 2</u>
Performance Standards	State or local	State or local
System Ownership	Nonprofit group ¹	Nonprofit group
Routine Maintenance		
Inspections	Private contractor ²	Nonprofit group or homeowners' association
Septage pumping	Private contractor	Nonprofit group or private contractor
Correction of Failing Systems		
Inspections	Private contractor	Nonprofit group or homeowners' association
Permit issuance	State or local	State or local
System repair/replacement	Private contractor	Nonprofit group or private contractor
Homeowner Education	Nonprofit group	Nonprofit group
Monitoring	Private contractor	Nonprofit group

EVALUATION:

Responsiveness: The nonprofit corporation concept is an attractive alternative for small community systems management since the wastewater system is owned by the residents themselves.

Enforcement: Regulatory agencies in most states have not approved small wastewater system management programs administered by homeowners' associations because of the lack of confidence in this form of management entity. The reluctance to use homeowners' associations (and other nonprofit organizations) stems from the concern that members of these groups cannot devote adequate attention to wastewater system maintenance because of their part-time status or widespread responsibilities to other association functions. Regulatory agencies may wish to consider the creation of third-party trusts or agreements to help ensure some degree of control over the quality and permanency of management services.

Sensitivity: A nonprofit corporation may be the only available option in some areas, in underdeveloped areas, or where local governments are unwilling to provide maintenance sources.

Staffing: Larger associations may be able to hire staff to perform all necessary administrative and maintenance duties, as well as contract with private firms or management companies for such services.

Coordination: Nonprofit corporations can originate from national organizations such as the National Demonstration Water Project or the Appalachian Regional Commission.

¹A rural cooperative, homeowners' association, or other form of nonprofit corporation with its own staff.

²Private firm hired by the nonprofit organization.

NONPROFIT CORPORATION -- SMALL COMMUNITY SYSTEMS
ILLUSTRATION

Small community wastewater systems installed to upgrade failing and substandard on-site septic systems in Otter Tail County, Minnesota, are operated and maintained by homeowners' associations. Members of these groups (group membership typically varies from 10 to 30 families) are responsible for checking pump operation and liquid depths in individual and community septic tanks. The typical wastewater system serving these small communities consists of individual system tanks connected to small diameter gravity sewers with wastewater disposal at a community drain field. The homeowners share the cost of electricity (about \$4.00 per home per year) and service calls to a pump distributor, septic tank installer, or septage hauler when needed. The members of these groups are concerned with water quality protection because of the recreational value of the lakes, and along with technical assistance services (such as system design and maintenance recommendations) from the county regulatory agency, devote sufficient attention to system performance and operational requirements.

INSTITUTIONAL OPTIONS -- RESIDUALS DISPOSAL

A major component of the operation and maintenance function is the regulation of the disposal of residuals, i.e., septage from septic tanks and sludge from treatment facilities. A comprehensive regulatory program should be designed to assure that septage pumped from on-site systems and sludge accumulated at treatment facilities would be safely and properly disposed of at an approved facility. To accomplish these objectives, state and/or local regulatory programs should address the following major residuals disposal issues:

1. Disposal facility siting, design, design review, and construction approval.
2. Licensing and certification of individuals involved in the cleaning or repairing of septic systems and small community systems.
3. Licensing and certification of individuals involved in the transport of septage and sludge for treatment.
4. Recording septage pumping events, volume of residuals transported and location of disposal.
5. Periodic inspection and certification of all vehicles used to transport residuals.
6. Limiting the disposal of residuals to approved sites.
7. Regulating the method of disposal at those sites (i.e., establishing performance standards for facility operation residuals disposal).
8. Operating and maintaining residual disposal facilities in accordance with prescribed performance standards.
9. Inspection of treatment and disposal facility construction and operation.

These activities can be provided by several types of agencies, as well as the private sector:

1. State agencies.
2. County (or multicounty) agencies.
3. Municipal (or multimunicipal) agencies.
4. Special purpose agencies and public authorities.
5. Private companies (e.g., private septage haulers).

Table 44 illustrates a matrix of institutional options for various residuals management responsibilities. As shown, state and local agencies and private interests are involved in various aspects of residuals management. In most instances, state agencies are involved in setting criteria and establishing licensing programs, while local governments assume responsibility for the surveillance of hauler activities and the inspection of equipment and disposal facilities.

The determination of institutional arrangements for various residual management activities such as hauler registration, licensing, vehicle inspection, disposal facility design, etc. can be accomplished in conjunction with related wastewater system design and operation and maintenance institutional analyses. The selection of institutional arrangements for disposal facility ownership and operation, however, could require a separate institutional assessment. A discussion of alternative arrangements for septage disposal follows.

Public Ownership and Operation

Towns, counties, cities, or states can own and operate residuals treatment and disposal facilities. The facilities can be located in conjunction with a wastewater treatment facility, solid or hazardous waste disposal facilities, or consist of a separate treatment and disposal facility. In states where enabling legislation allows establishment of multigovernment ownership arrangements, such treatment and disposal facilities can serve a large geographic area. Because this arrangement relies on the participation of two or more units of government, certain legal measures may be necessary to protect the integrity of the arrangement from a withdrawal of one of its members. A multi-year membership requirement, with periodic extensions, may add stability to such an arrangement.

Both public and private haulers may be able to use the facility. For the single local unit of government (such as a county or municipality), the use of the facility could be restricted to haulers servicing residences within that jurisdiction (see Table 45, option 1). One variation could be that the facility is owned and operated by a single local unit of government, but accessible to persons residing outside its political boundaries (option 3). State agencies responsible for allocating construction grant funds for treatment facilities should consider a mandatory regional service area arrangement for newly constructed treatment facilities. These mandatory service requirements should be reflected in wastewater facilities plans and areawide water quality management plans.

TABLE 44. DESCRIPTION OF RESIDUALS DISPOSAL FUNCTIONS

Function	Description	Implementing Entity			
		Public Agencies			Special Purpose Agency
		State	County/Regional	Municipal	Private Firms
Establish Criteria for Residuals	Criteria for disposal facility siting, design, and operation.	•	•	•	•
Design Disposal Facility	Select type, location and size of treatment and disposal facility.	•	•	•	•
Design Review/Permit Issuance	Evaluate site information and proposed design. Approve/disapprove recommended design. Issue permit to build facility.	•	•	•	
Facility Construction Inspections	Visit site to ensure facility is properly sited, sized, and installed. Several visits may be necessary.	•	•	•	
Facility Ownership	Establish fiscal and legal requirements for maintenance and repair.	•	•	•	•
Facility Maintenance	Conduct periodic inspection of facility operation. Inspection frequency is variable. Perform maintenance activities.	•	•	•	•
Regulation of Haulers and Hauling Equipment	Inspect pumping and transport vehicles. License pumpers. Approve pumpers utilizing disposal facility. Monitor hauler activities.	•	•	•	
Residuals Pumping and Transport	Pump residual waste and transport to disposal site. Could involve re-portioning of origin and destination of wastes.			•	•

TABLE 45. PUBLIC OWNERSHIP AND OPERATION -- RESIDUALS DISPOSAL

Description:	MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:			
	Option 1	Option 2	Option 3	
Operational Performance Standards	State	State	State	
Facility Ownership	Single government mental entity	Multigovernmental entity ²	Single government mental entity	
Facility Service Area	Single government mental entity	Multigovernmental entity	Multigovernmental entity	
Facility Operation	Single government mental entity ³	Multigovernmental entity	Single government mental entity	
Residuals Transport	Public/private ⁴	Public/private	Public/private	

EVALUATION:

Responsiveness: Local governments (counties and municipalities) are able to provide services for residents within their jurisdiction, and respond well to homeowner needs. Problems may appear in multilocal service arrangements.

Enforcement: Option 1 allows better coordination between small systems design and operation programs and residuals management. Option 2 can accomplish the same coordination if the regulatory structure for small systems design and maintenance fits one of these strategies.

Sensitivity: Local government operations of sewage treatment and solid/hazardous waste disposal facilities can create opportunities to combine these activities with residuals treatment and disposal.

Staffing: All options create the need for staffing to deal with facility maintenance and recordkeeping. Option 3 allows the staffing burden to fall on a single entity.

Coordination: Effective coordination of residuals management with other waste management activities can be accomplished through public ownership and operation. The precise strategy to follow will depend on local circumstances.

¹Single governmental entity is a county or municipality.
²Multigovernmental entity is a group of counties or municipalities.
³In this case, the single governmental entity can be a county, municipal, or state agency.
⁴Public refers to septage haulers employed by governmental agencies. Private refers to private haulers.

A frequently cited problem with the use of publicly-owned wastewater treatment plants which also handle septage and sludge wastes, is that the plant operator for local jurisdiction can, without warning, refuse to accept septage from a private hauler. Many plant operators are given the discretion (by the local governing body) to deny a hauler the right to dispose of septage because of the potential harm the septage load may have on the treatment plant. Municipal treatment plants, because of their size or treatment processes, sometimes cannot handle large volumes of septage, and septage handling facilities are not always available at the treatment plant site for the storage or pretreatment of the residual waste. State or regional (multi-county) ownership and management of residuals disposal facilities (options 2 and 3) may help to avoid potential intermunicipal conflicts, and further promote the monitoring of residual waste disposal activities within a large service area.

There are many localities that own and operate treatment plants and land disposal sites for the disposal of septage from on-site systems, while other municipalities administer hauling services. The following examples illustrate alternative arrangements.

PUBLIC OWNERSHIP AND OPERATION -- RESIDUALS DISPOSAL ILLUSTRATION

The Town of Acton, Massachusetts and Fairfax County, Virginia own and operate septage treatment facilities. Acton operates a lagoon which receives only septage, and Fairfax County operates two wastewater treatment plants that receive septage. In both cases, the use of the treatment facilities is restricted to the use of private haulers servicing residences within the town or county, respectively. In Acton, the hauler must purchase a coupon from the Town Clerk and present the coupon to the attendant at the treatment facility before he is allowed to dispose of the septage. In Fairfax County, color-coded decals are placed on the windshield of the hauler vehicles as proof of payment of an annual license fee which covers the costs of septage treatment.

Septage hauling and treatment services for community septic tank drain field systems in several counties in the State of Washington are provided by county departments of public works. Septage pumping is provided, along with system inspections and general maintenance services.

PUBLIC OWNERSHIP AND OPERATION -- RESIDUALS DISPOSAL ILLUSTRATION (CONTINUED)

Statewide participation in residuals disposal is found in Connecticut where facilities for materials recovery, conservation, and disposal are being established on a regional basis. Septage disposal is not currently being handled, but the state regional arrangement does offer promising opportunities.

Special Agency Ownership and Operation

A special single- or multipurpose agency can be created to provide residuals treatment and disposal facilities (see Table 46). Special purpose agencies can assume a variety of forms, including special districts, public authorities, or utilities. The service area of a special purpose agency for residuals management purposes can consist of contiguous or noncontiguous communities or parts of communities.

Many sewer authorities provide special septage handling facilities at their conventional wastewater treatment facilities. One such agency is the Seattle, Washington METRO agency.

SPECIAL AGENCY OWNERSHIP AND OPERATION -- RESIDUALS DISPOSAL ILLUSTRATION

The Seattle METRO (a public authority) has installed a controlled access disposal site at its wastewater treatment facility which automatically records the amount of septage being discharged. The driver of the incoming septage truck inserts a special magnetic card into the gate control and recording device. The card contains a vehicle identification number, and the volume of septage disposed of at the facility, as well as the time of disposal, is made available to the plant operator.

Through its areawide water quality management program, the Seattle METRO is currently studying the feasibility of establishing on-site/septage management programs for its member counties.

TABLE 46. SPECIAL AGENCY OWNERSHIP AND OPERATION --
RESIDUALS DISPOSAL

Description: Special agencies are autonomous units of local government that can own and operate residuals disposal facilities.

MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:

	<u>Option 1</u>	<u>Option 2</u>
Operational Standards	State or local	State
Facility Ownership	Special purpose agency	Special purpose agency
Facility Service Area	Single governmental area	Multigovernmental area
Facility Operation	Special purpose agency	Special purpose agency
Residuals Transport	Public/private	Public/private

EVALUATION:

Responsiveness: Agency board of directors is the governing body. Members can be elected by service area residents or appointed by the local governing body.

Enforcement: Special purpose agencies have flexible and broad regulatory powers.

Sensitivity: Economies of scale can be achieved through regional service areas made up of groups of local municipalities.

Staffing: Special purpose agencies can maintain their own staff in performing maintenance duties.

Coordination: Integration between wastewater, solid waste, and hazardous waste management and residuals disposal can be achieved through multipurpose special agencies.

Private Ownership and Operation

Private companies also own and manage septage and sludge disposal facilities for use by public and private haulers (see Table 47). Typically, privately-owned facilities are land disposal sites owned or leased from a private landowner, for the use of a single private hauler or hauling company. The location of the disposal site, therefore, depends on the availability of land to the private company or the willingness of a private landowner to allow land disposal (in areas where regulations allow land disposal).

Private ownership and management can be an attractive alternative, especially when a group of localities fail to cooperate in residuals management activities. Privately-owned disposal sites can be established for the use of private haulers in servicing individual residences on an as needed basis or by communities (or on-site management programs) on a contract basis. For example, a single community or group of communities can contract with a private company for residuals disposal services. The private company could contract directly with the community (or on-site management program) for a specified period of time.

PRIVATE OWNERSHIP AND OPERATION -- RESIDUALS DISPOSAL

Residuals disposal at privately-owned sites is common in almost every state. Because of the shortage of accessible and reliable public treatment facilities in most areas, private haulers are left with the responsibility of finding adequate disposal sites. Many haulers find this to be a frustrating burden and often refuse to handle wastes in localities that do not provide septage disposal sites. Septage management studies performed in New Hampshire and Vermont, for example, point out that many towns do not meet state legislation that requires each town to make arrangements for adequate septage disposal.

Private company-owned and operated residuals disposal facilities could be as small as a farmland parcel used by a single hauler, a treatment plant for septage treatment, or combined wastewater/septage treatment. General Development Utilities in South Florida is an example of a private utility that owns and operates several wastewater treatment plants and also has several hauling vehicles to pump septic tanks for their septic tank effluent pump (STEP) system.

TABLE 47. PRIVATE OWNERSHIP AND OPERATION --
RESIDUALS DISPOSAL

<u>Description:</u> The private ownership of residuals waste facilities is a common strategy for dealing with the disposal of septage.		
<u>MANAGEMENT FUNCTIONS -- INSTITUTIONAL ARRANGEMENTS:</u>		
	<u>Option 1</u>	<u>Option 2</u>
Operational Performance Standards	State or local	State or local
Facility Ownership	Private	Private
Facility Service Area	1	Contract or franchise area
Facility Operation	Private	Private
Residuals Transport	Private	Private

EVALUATION:

Responsiveness: Private firms tend to be responsive to customer needs.

Enforcement: State and/or local agencies are typically charged with inspecting and approving disposal sites owned and operated by private haulers.

Sensitivity: Private firms tend to locate disposal sites to serve the disposal needs of their individual firm. The location of disposal sites generally has little relation to septage generation rates, other than through the minimization of transportation costs.

Staffing: Private firms usually are more efficient in terms of staffing size and efficiency.

Coordination: Local governments can set up franchise areas or contract residual waste handling and disposal services with private firms. Contracting with private companies reduces the burden on local government to acquire disposal sites or transportation equipment.

Service area consists of individual homeowners who contract with private haulers.

CHAPTER 5
FORMULATING A FINANCIAL PLAN

Financing a wastewater system involves securing grants and loans to cover capital expenditures, and collecting revenues to support annual debt service and operating costs. Although it has historically been very difficult to obtain Federal construction grant funding for projects serving small communities, recent legislation (PL 95-217) has made more funding available. It is important to recognize that the community must be able to support its local share of the costs, which include nonfundable capital expenditures, and annual operating costs. This cannot be overemphasized in planning wastewater systems, especially for rural small communities with limited financial resources.

Generating sufficient revenues to cover debt service and operating costs is essential for any management program to remain viable. This can be done through many different mechanisms ranging from permit fees to service charges. The method of collecting revenues will largely depend on the type of wastewater system being managed, although any number of methods might be employed to finance the various elements of a management program. No matter what kind of wastewater facilities are involved, it can be difficult to equitably allocate the cost of a system among individual users.

This chapter discusses various methods of financing capital costs and generating revenues as they apply in developing a financial plan. The discussion will emphasize the importance of proper financial planning, and will illustrate different institutional arrangements for implementing such plans. Key financial management topics are addressed in this chapter, including:

1. Ownership - maintenance liability of wastewater systems.
2. Distribution of costs among user classifications.
3. Methods of collecting user fees.

4. Procedures for estimating manpower requirements and costs associated with technical plan recommendations.

The financial plan addresses who will pay for new wastewater management services, how much they will pay, and when. These financing issues are discussed in later sections of the chapter with regard to:

1. On-site systems.
2. Small community systems.
3. Septage disposal.

Associated institutional and technical considerations that local agencies and service area residents should address prior to (and in conjunction with) formulating a financial plan include:

1. What types of wastewater systems are to be applied, and what areas will they serve?
2. Who will design and install new wastewater systems?
3. Who will operate and maintain these facilities?
4. Who will repair and replace failing equipment?

The financial plan will identify the roles and responsibilities of participating entities in carrying out management functions, as determined in the operations plan (Chapter 4). More importantly, the financial plan specifies how the financing of the project will be handled.

Users of this report should review EPA reports developed through the Financial Management Assistance Program (FMAP) for additional guidance on financial issues and financing strategies. These reports are available from EPA regional offices and from the Water Planning Division of the Office of Water Program Operations in Washington, D.C.

GUIDE FOR FINANCIAL PLAN FORMULATION

A major concern in preparing a financial plan is defining the manner in which the local share of the total project costs is to be allocated among potential users. This section of the chapter outlines a series of analysis steps to be followed in developing an equitable financing approach. After initial cost

estimates are made for comparing technical alternatives and overall financial impact of the project, the subsequent financial analysis of the selected plan should include the following steps:

- Step 1 -- Determine capital cost requirements and funding availability.
- Step 2 -- Estimate future annual operating costs.
- Step 3 -- Calculate average user costs and review cost allocation methods.
- Step 4 -- Develop user cost collection mechanisms.
- Step 5 -- Assess economic impacts of the financial plan on service area residents.

As listed above, the process of formulating a financial plan involves the estimation of capital costs, manpower requirements, labor and nonlabor costs, and finally, cost allocation mechanisms. This process can be a difficult and time-consuming endeavor, however, the acceptance of a wastewater management plan by a community can depend on the reasonableness of out-of-pocket costs. Creative financing is often necessary to address the complex equity issues that typically arise in planning for small wastewater systems.

Step 1: Determine capital cost requirements and funding availability.

The construction and upgrading of wastewater systems will involve an outlay of capital expenditures. Technical planning activities will define the technology to be applied and the associated capital cost requirements. In order to undertake such capital improvements, a management agency should be able to accept and utilize grants from various sources, incur debt, and raise revenue to cover the balance of costs not paid from grant funds (i.e., the local share of capital costs).

Table 48 lists the major issues associated with financing capital costs for small wastewater facilities. These issues include:

1. Assessing funding availability and eligibility rules.

2. Determination of local share of capital costs and debt service estimates.
3. Evaluation of management agency capabilities to finance wastewater system capital costs.

Table 49 lists the major wastewater system cost items and presents a method for calculating the local share of capital costs. Information prepared in this table will be used with subsequent calculations in deriving an estimate of annual costs to users.

A discussion on financing the local share of capital costs is contained in Step 3.

Step 2: Estimate future annual operating costs for the project.

Generally, Federal and state sources of grants for wastewater treatment facilities will not pay for operating expenses. These costs are reserved for the residents being served by the project. Estimating the annual operating costs for the project involves:

1. Assessing the administrative and maintenance requirements for the chosen wastewater technology (from the operations plan).
2. Calculating manpower requirements for system operation and maintenance and program administration based on the number of systems to be served, the frequency of service, and the services to be performed by the managing entity.
3. Calculating other costs supporting direct manpower activities.
4. Translating manpower requirements into salaries and estimated total annual costs.

Most of the information required for these calculations is available from the operation plan (Chapter 4).

Table 50 provides a format for identifying program staff requirements as a first step in calculating annual operating costs. The user can apply this table in estimating staff needs for a particular management approach. The outputs of this table

(staff size and responsibilities) are used in calculating total operating expenses, as shown in Table 51. This table lists the major components of operating costs in a format that can be readily applied to cost estimating.

Figures 9 and 10 present approximations of total program costs for on-site and small community system management programs. The graphics display program costs according to service area size (as measured by the number of dwelling units served). These costs do not reflect annual debt service, septage pumping, or capital improvements, and reflect only the costs of program operation (as calculated in Table 51).

Impacts of economies of scale, as reflected through the use of a full-time or part-time staff, are also taken into account in these graphics. A more specific analysis of possible economies of scale in management approaches can be accomplished through the detailed manpower/functional analysis shown in Tables 50 and 51. By utilizing these tables, a closer approximation of the actual staff requirements (i.e., full-time or part-time staff) can be derived. Figures 9 and 10, on the other hand, have manpower assumptions incorporated into the derivation of the service area size/operations incorporated into the derivation of labor, however, were estimated on the basis of manpower requirements per system, not on actual staff requirements (which might result in less than full-time utilization of manpower). For illustrative purposes, the threshold levels for one full-time staff-person (to cover technical and administrative duties, other than clerical) are identified in these graphics.

The cost data that appear on Figures 9 and 10 are approximations, and are included to serve as a general guide for comparing gross program costs. The user should review the assumptions contained in the cost curves before applying them to a specific situation. Therefore, it is recommended that the procedure presented in Tables 50 and 51 should be utilized in preparing program cost estimates for facility planning purposes. (Figures 9 and 10 can be used to calculate preliminary estimates of program operating costs.)

Step 3: Calculate average user costs to cover local share of capital costs and annual operating costs. Identify funding allocation methods to be used to generate revenue.

Developing a financial plan for small wastewater systems management involves packaging a number of different financing techniques to suit the fiscal requirements and administrative capability of the local management entity.

The previous steps have generated the necessary information to begin developing an overall strategy for financing the wastewater management plan. This financial strategy should be flexible enough to adapt to rising costs, future system needs, and potential new funding opportunities. In addition, the strategy should be equitable to all users and generate sufficient revenue to cover annual costs. Data generated in this step can also be used to compare the financial impacts of management plan alternatives.

The calculation of an annual average user cost is a key step in the process of developing a financial plan. Table 52 presents a sample format for calculating total annual costs, utilizing the results of the calculations from Tables 49 and 51. The final calculation yields an estimate of the average user cost (i.e., the total cost of the management program divided by the total number of homes or properties served). This average cost does not necessarily represent the actual annual cost to the user, and it is not necessarily the most equitable means of allocating costs. It does, however, serve as an effective measure of the fiscal impact of alternative management plans on existing and future users.

Revenues to cover total program costs calculated in Table 52 can be generated through a variety of mechanisms described in Tables 53 and 54. The methods relate to the allocation of costs to users through service charges, property taxes, or user charges, and to different methods for financing the local share of capital expenditures. A more detailed discussion of these methods as they apply to financing on-site, small community, and residuals management programs can be found in the following sections in this chapter: "Institutional Options -- On-Site Systems," "Institutional Options -- Small Community Systems," and "Institutional Options -- Residuals Disposal."

Step 4: Develop mechanisms to collect user costs from service area residents.

An important concern in formulating a financial plan is for the management entity to assure that service charges and other fees assessed to the service area resident will be paid. The ability to collect user fees, however, is tied directly to several legal issues which must be addressed, such as:

1. Compelling the formation of a management agency by state or local governments.
2. Compelling individuals to participate in the management program, and connect to an off-site treatment and disposal system.
3. Gaining authority to enter onto private property to maintain these systems.

It is necessary for a potential management entity to assure that it possesses sufficient authority to set and collect user costs to cover the program's annual operating and debt service expenses.

Table 55 presents several options that may be used to enforce the collection of user charges and compliance with management requirements. The management entity may be reluctant to impose some of these enforcement methods where the resident simply cannot afford the cost of system repair or replacement. It is, therefore, necessary that along with the power to incur debt, receive grants, and impose liens on property, the management entity should have the authority to issue low-interest loans for system replacement, to charge for work on an installment basis, or to accumulate a capital fund for future equipment replacement or repairs.

Step 5: Assess impacts of the financial plan and project on service area residents.

A final step in developing a financial plan is the assessment of fiscal impacts on the community residents; that is, can the community afford the project? The evaluation criteria to perform this assessment are shown in Table 56.

In some instances it may be necessary to perform a burden analysis of projected costs. This procedure will generate an estimate of the cost burden on the average household in the future under various assumptions about pricing policies, growth in new users, and inflation in operations and maintenance costs. For a complete discussion of the burden analysis methodology, see "Worksheets and Instructions for a Screening Procedure for Water Pollution Control Projects," Government Finance Research Center, Municipal Finance Officials Association (MFOA) and Peat, Marwick, Mitchell and Company, Washington, D.C., February 1979. This document and others addressing similar financial management issues have been developed by the Financial Management Assistance Program (FMAP). Information is available from EPA regional office and the Facilities Requirements Division of the Office of Water Program Operations in Washington, D.C.

TABLE 48. PROCEDURE FOR ASSESSING CAPITAL COST REQUIREMENTS FOR MANAGEMENT AGENCIES

Assessment of Funding Availability and Eligibility Rules

- Identify Federal and state funding programs (grants and loans) which may be applicable. (A brief discussion of Federal funding programs for wastewater treatment facilities appears in Chapter 3, in the subsection "Institutional Options.")
- Contact Federal and state agency personnel responsible for applicable Construction Grant Programs to assess funding availability, eligibility requirements, and application procedures.
- List available sources of grants and loans and compile eligibility rules to fund various capital cost components.

Determine Local Share of Capital Costs

- Obtain cost estimates for wastewater collection and treatment facility construction costs, plus costs for land, easements, engineering fees, legal fees, etc. (Include estimates of initial capital costs, facility expansion and replacement costs.)
- Calculate local share by subtracting grants from total capital costs, based on eligibility rules. (See Table 49 for sample calculation procedure.)
- Check enabling legislation and charters to determine whether management agencies can accept grants from Federal and state agencies. (See Table 18.)
- Check enabling legislation and charters to determine methods of financing the local share of capital costs of different institutional arrangements (see Table 18).

TABLE 49. PROCEDURE FOR CALCULATING
LOCAL SHARE OF CAPITAL COSTS

System Components	Total Cost	EPA Grant Share ¹ Eligible	Ineligible
1. Total Construction Cost of Proposed Facilities			
Initial Capital Investment			
a. Collection lines			
b. Interceptor (trunk) lines			
c. Residuals treatment/disposal facility			
d. On-site treatment/disposal facilities			
e. Pumping units and pump stations			
f. House connections			
g. Land purchase + options			
h. Rights-of-way acquisition			
i. Residuals hauling vehicles and equipment			
Construction Cost Summary			
j. Total cost (1a through 1i)			
k. Total eligible cost			
l. Total ineligible cost			
2. Engineering and Legal Fees			
a. Engineering costs (for system design)			
b. Legal fees (for rights-of-way acquisition, developing charters and ordinances, etc.)			
c. Total cost (2a + 2b)			
3. Expenditures Anticipated During Planning Period			
a. Equipment replacement			
b. Cluster system upgrading/expansion			
c. Rehabilitation of individual systems			
d. Purchase of miscellaneous equipment			
e. Total expenditures			
4. Capital Cost Analysis for Proposed Project			
a. Total construction cost of proposed facilities (1j)			
b. Total engineering and legal fees (2c)			
c. Costs eligible for EPA Construction Grant funds (4a+4b)			
d. EPA share (at _____ %)			
e. State share (at _____ % (if applicable))			
f. Local share of costs (4a+4b-4d-4e)			
g. Local share of costs (11+3e)			
k. Total local share (4f+4g)			
l. Total annual _____ local share of capital costs. ³			

¹Calculate eligible costs based on EPA Construction Grants and state matching share. Indicate grant share as a percent of eligible costs.
²Identify other Federal or state funding programs and check for eligibility rules.
³Use a 20-year planning period for a loan or bond maturity at the estimated rate of interest for this initial calculation. The precise method of financing the local share is discussed in Step 3.

TABLE 50. ESTIMATING PROGRAM STAFF REQUIREMENTS

Function	Implementing Entity ¹	Assumptions and Calculations ²	Annual Work Day Requirements ³
New Installations			
• Site evaluation			
• Design review			
• Installation supervision			
• Permit issuance			
System Maintenance			
• Routine maintenance (inspections)			
• Emergency maintenance (service calls)			
• Customer relations			
• Permit renewals			
System Repair/Replacement			
• Failed system inspection			
• Installation supervision/performance			
• Violation notices			
• Permit renewals			
Residuals Disposal			
• Pumping			
• Treatment and disposal			
Monitoring			
• Surface-water quality			
• Groundwater quality			
• Wastewater discharge			
• Special systems monitoring			
Administration/Planning/Financing			
• Office administration			
• Compliance reporting			
• Financial management			
• Bookkeeping			
• Billing and accounting			
• Public relations/education			
• Program coordination			
• Maintenance recordkeeping			

SAMPLE FORMAT

¹As identified in the operations plan.
²Determine frequency and number of visits and time involved in performing various functions.
³Indicate staff category, e.g., managerial, technical, clerical (see Table 51).

TABLE 51. CALCULATION OF OPERATING COSTS			
	(A) Annual Salary	(B) Adjusted Salary ¹	
<u>Labor</u>			
Program manager	\$		
Assistant manager	\$		
Professional staff	\$		
Field crews, technicians, operators	\$		
Clerical/bookkeeping staff	\$		
Total salary costs (from column B)		\$	
Insurance and benefits (___% of total salary costs)		\$	
Total labor costs		\$	
<u>Nonlabor</u>			
Treatment system	\$		
Utilities, chemicals, etc.	\$		
Vehicle maintenance	\$		
Miscellaneous equipment, tools, etc.	\$		
Replacement parts, etc.	\$		
Treatment service charges	\$		
Residuals disposal charges	\$		
Private contractor service charges	\$		
Testing equipment	\$		
Laboratory analysis	\$		
Office expenses (rent, postage, supplies, utilities, etc.)	\$		
Staff training	\$		
Training courses, seminars, etc.	\$		
Consultant services	\$		
Legal/accountant services	\$		
Taxes	\$		
Insurance (on equipment)	\$		
Miscellaneous expense (e.g., mileage)	\$		
Total nonlabor costs		\$	
Total operating costs		\$	
SAMPLE FORMAT			
¹ Adjusted salary (column B) = average annual salary (column A)			
x total man-days required (Table 50)			
x total man-days in one man-year			

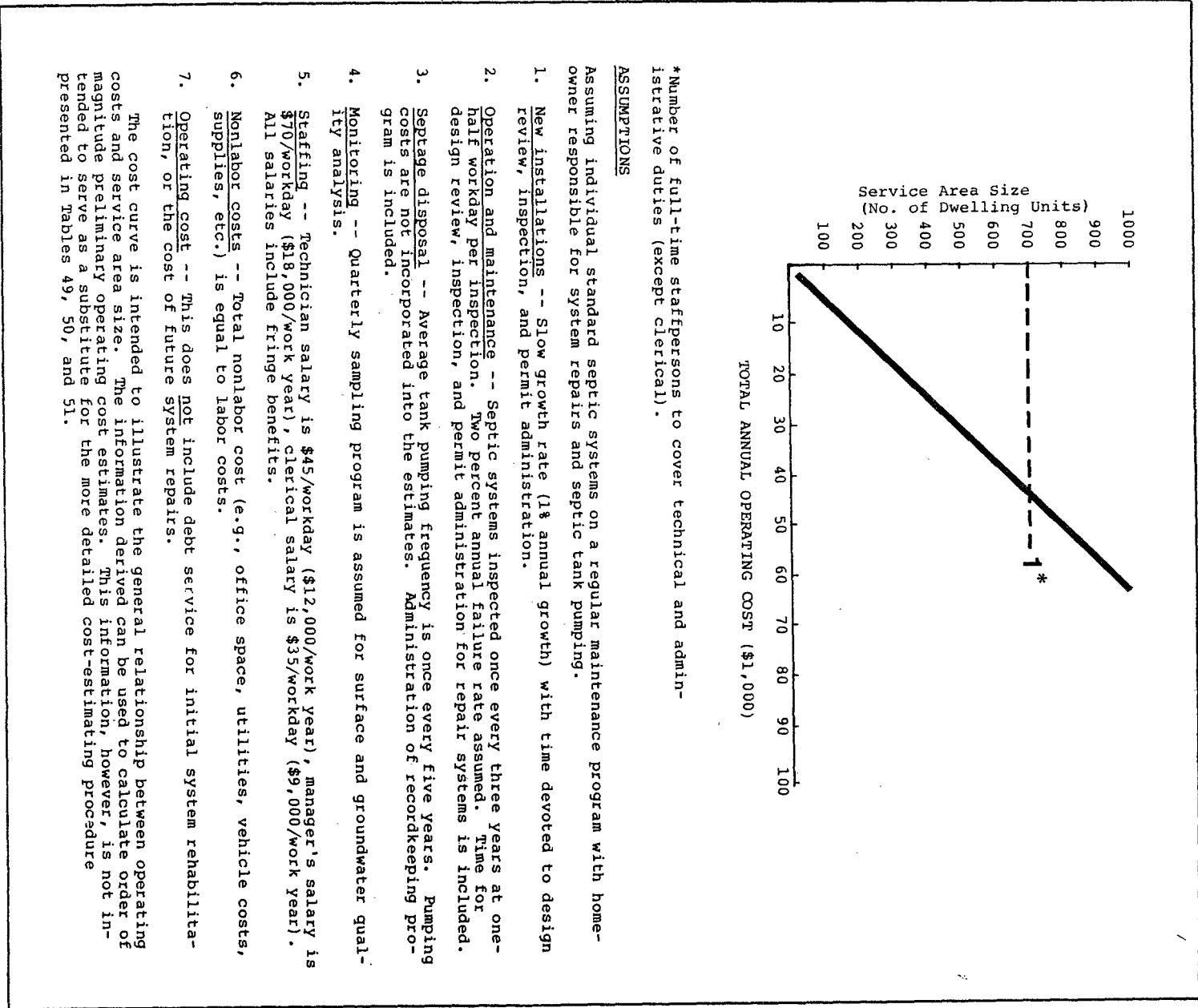
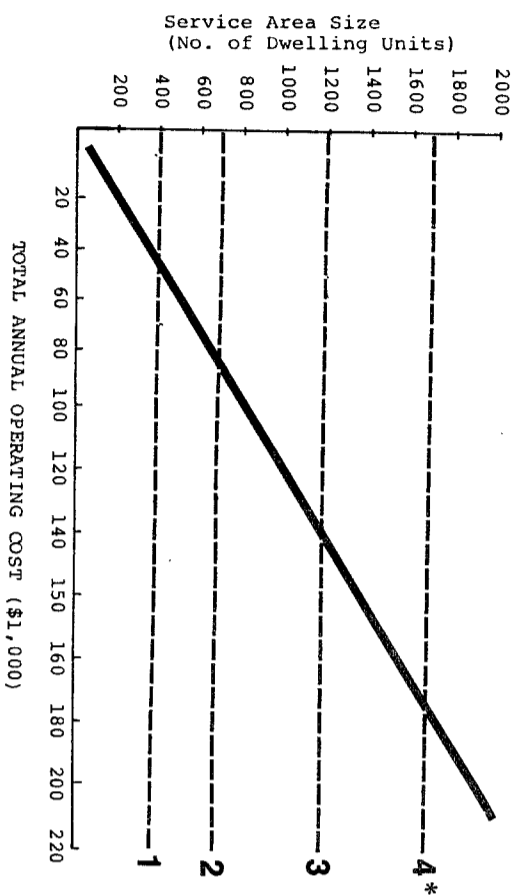


Figure 9. Typical relationship between operating cost and service area size for conventional on-site systems.



*Number of full-time staffers to cover technical and administrative duties (except clerical).

ASSUMPTIONS

Assuming small diameter pressure sewer system with individual grinder pumps (one pumping unit per household), and aerated lagoon treatment facility with surface discharge.

1. New installations -- Slow-moderate growth rate (3% annual) for future connections.
2. Operation/maintenance -- Each pump unit inspected once every two years for preventive maintenance and service at one-half workday per inspection. Collection line and treatment facility maintenance also included. Maintenance costs were adjusted by facility and service area size.
3. Staffing -- Technician (plant operator/inspector) salary of \$55/workday (\$14,400/work year), manager at \$70/workday (\$18,000/work year), and clerical at \$35/workday (\$9,000/work year), including fringe benefits.
4. Nonlabor costs -- Costs for office expenses, vehicle costs, and equipment are one and one-half times the labor costs.
5. Operating costs -- This does not include debt service for initial capital improvements, pump replacement costs, and cost of purchasing and installing pump units for future connections.

The cost curve is intended to illustrate the general relationship between operating costs and service area size. The information derived can be used to calculate order of magnitude preliminary operating cost estimates. This information, however, is not intended to serve as a substitute for the more detailed cost-estimating procedure presented in Tables 49, 50, and 51.

Figure 10. Typical relationship between operating costs and service area size for small community systems

TABLE 52. CALCULATION OF AVERAGE ANNUAL PROGRAM COSTS TO USERS

Total Local Share of Capital Costs (Table 49) (Excluding all grants)
Total Labor and Nonlabor Operating Costs (Table 51)
Total Annual Costs (Local share, plus operating costs)
Total Number of Users (Specify number of existing homes or developable properties to be served)
Average Annual User Cost ¹ (Divide total annual cost by number of users)

The calculation of this cost assures that the final user cost includes all direct and indirect costs of supporting the wastewater management program. Thus, the program is self-sustaining on the basis of annual revenues generated. The average annual user cost can then be translated into an actual annual charge through the application of the alternative financing and cost allocation methods presented in Tables 53 and 54.

TABLE 53. METHODS FOR FINANCING LOCAL SHARE

Mechanism	Description	Advantages	Disadvantages
Loans	Loans can be obtained from Federal and state sources for system construction. Loans are also available from commercial lending institutions. Loan programs can be established by states or local governments to assist homeowners in repairing failing systems.	Generally, state and Federal agencies can issue low interest loans with long-term paybacks.	Lending agency may require certain provisions (e.g., power to levy taxes) to assure managing agency ability to retire the debt. Commercial loans will generally be available at a higher interest rate.
General Obligation Bonds	Bonds backed by the full faith and credit of the issuing entity. Secured by the taxing powers of the issuing entity.	Commonly used by local governments. Interest rates are usually lower than other bonds. Offers considerable flexibility to local governments.	Community debt limitations may restrict their use. If property taxes are used to retire debt, costs may not necessarily be paid for solely by the project beneficiaries.
Revenue Bonds	Bonds retired by the revenue of the facility.	Can be used to circumvent local debt limitations. Popular alternative to G.O. bonds.	Do not have the full faith and credit of local government. Typically higher interest rate than G.O. bonds.
Special Assessment Bond	Bonds payable only from collection of special assessments (e.g., front footage assessment); not from property taxes.	Removes financial burden from local government. Useful when direct benefits are easily identified.	Can be costly to individual landowners (especially large lots). May be inappropriate in several areas due to nonuniform lot sizes. May have higher interest rate.
Special Benefit Assessment	Direct fees or taxes on the property. Sometimes referred to as an improvement fee.	Useful where benefits to properties from capital improvements are identifiable. Can be used to reduce local share debt requirements for financing. Also can be used to establish a fund for future capital investments.	Initial lump sum payment of assessment may be a significant burden on individual residents.
Connection Fee	Levied at the time a user connects to the wastewater system (not considered a tax or benefit assessment). Can be divided into two or more one-time payments to reduce initial burden on homeowner.	Often used to recover actual costs for connection to the system. A unique application is in raising the local capital share of system upgrading and replacement often found in on-site management programs.	Initial lump sum payment of assessment may be a significant burden on individual residents.
Reserve Fund	A part of utility revenue is placed in a separate fund each year, and invested in order to accumulate adequate funds to finance capital improvements.	Avoids the expense of borrowing. Can be used to finance future system repairs that are not eligible for initial grants.	Account is based solely on system revenues. Poor management of the fund can lead to default.
Ad Valorem	Tax computed on the assessed valuation of all property within the jurisdiction of the issuing entity.	Spreads the costs of the project to all taxpayers on a uniform basis. Administrative cost to collect taxes can be low, if taxes are low. Eligible tax deduction for the homeowner.	Has potential to spread costs to properties not benefitting from the project. Review Federal regulations before using property tax financing methods when Federal grants are involved. (CFR 40, Part 55, Subpart E, 1 October 1978).

TABLE 54. ALTERNATIVE COST ALLOCATION TECHNIQUES

Mechanism	Description	Remarks
Service Fee	Charges levied at the time a specific service is performed. Commonly used to cover administrative costs of design/installation, operation and maintenance, and residuals disposal. It is a flexible tool, with both uniform and variable rate structures.	Can be levied as a uniform rate for: <ul style="list-style-type: none">• Inspections• Septage pumping• System repairs or replacement (e.g., for pumping units)• Visits for site evaluation or problem diagnosis• Design reviews, recordkeeping, and permit issuance Variable rates with each activity could be levied to account for: <ul style="list-style-type: none">• Monitoring/inspection requirements for wastewater systems.• Travel time for visitation• Length of service time• Type of wastewater system• Other user classifications (See User Charge remarks)
Property Taxes	Financing total management program cost through general property tax rates. Eliminates the need for separate service charges.	Can be calculated as average increase in property tax millage rate by dividing annual program costs by average tax assessment value per property.
User Charge	Monthly or annual fee set to cover amortization costs, operation and maintenance costs, equipment repair or replacement. The fee structure could consist of an annual service fee (for O&M expenses), special assessments and connection charges for recovering capital costs (see Table 52). Can be a fixed or variable rate depending on the precise cost-sharing mechanism chosen (see Remarks).	Alternative allocation methods include uniform rates or variable rates, based on: <ul style="list-style-type: none">• Residential/commercial/industrial users• Permanent residents/seasonal residents• Existing residents/future residents• Low or fixed-income residents• Active income producers• Users with conventional systems/users with experimental or nonconventional systems• Age or operating condition of the system (when existing septic systems are involved).

TABLE 55. ALTERNATIVE USER COST COLLECTION METHODS

Collection Method	Description	Advantages	Disadvantages
Liens on Property	Local governing entity (with taxing powers) may add the costs of performing a service or past unpaid bills as a tax on the property.	Has serious enforcement ramifications and in worst instances, is enforceable.	Local government may be reluctant to apply this approach, unless the amount owed is substantial.
Recording Violations on Property Deed	Copies of violations, can, through administrative or legislature requirement, be attached to the property title (via registrar of deeds).	Relatively simple procedure. Can effectively limit transfer of property ownership.	Can be applied to enforce sanitary code violations; may be difficult to apply in collecting unpaid bills.
Presale Inspections	Conducting inspections of on-site wastewater system equipment prior to transfer of property ownership.	As a variation of above procedure, notice of violation may be given to potential buyer at the time of systems inspection.	May be difficult to implement due to legal restrictions.
Termination of Public Services	A customer's water, electric, or gas service may be terminated.	Effective procedure, especially if management entity is responsible for water supply.	Difficulty rests with the possible health impacts in terminating public services, and with the logistics of terminating water supply where private wells are used.
Fines	Monetary penalties for each day of violation, or as a surcharge on unpaid bills.	Fines can be levied through local judicial system as a result of enforcement of violations.	Effectiveness will depend on the authority vested in the entity issuing the fine.

TABLE 56. EVALUATION CRITERIA FOR FINANCIAL PLAN FORMULATION

Administrative/Legal Feasibility
<ul style="list-style-type: none">• Availability of grant assistance.• Ability to obtain maximum grant assistance.• Ability of management agency to act independent of budget constraints.• Ability of management agency to attract and maintain professional and nonprofessional staffing.• Ability of management agency to raise revenue, through various sources:<ul style="list-style-type: none">- Assessments.- Permit fees.- User charges.- Inspection fees.- Connection fees.- Other methods.
Fiscal Feasibility
<ul style="list-style-type: none">• Ability of users to pay for system capital debt service, operation and maintenance, rehabilitation, or replacement.• Relative cost of alternative management programs (type of agency, public/private relationships, scope of service).• Distribution of costs to various user groups (existing vs. future users, permanent vs. seasonal residents, etc.).• Impact of management programs on:<ul style="list-style-type: none">- Present and future local community budgets.- Provision of other public services.

INSTITUTIONAL OPTIONS FOR FINANCING ON-SITE SYSTEMS

Financing the various aspects of an on-site management program (i.e., system design, inspection, operation and maintenance) can be handled in several different ways. Three basic approaches, as shown in Table 54, include:

1. Service fees paid by the property owner to the managing entity for specific services related to regulating the design, installation, and maintenance of individual systems.
2. Property taxes levied on all property owners within the management entity's jurisdiction.
3. Monthly or annual user charges billed to property owners to cover the costs of the management program.

As noted in the introduction to this chapter, developing a financial plan for a wastewater management program will require inputs from other phases of the planning process, particularly the preparation of the operations plan, to address the following issues:

1. Who is the management agency?
2. Which residents are benefitting from management services?
3. How often will management services be required?
4. What is the structure of the management program; what functions will it provide?

Table 57 presents a set of generic institutional options for carrying out various on-site management functions. More precise definitions of institutional arrangements would be developed in the operations plan. The generic institutional options here serve to illustrate various management agency/home-owner relationships that affect the structure of the financing system. As shown in the table, an agency can assume some or all functions associated with on-site systems management.

In option 1, the selected management agency assumes limited system design and maintenance functions. A financing strategy would therefore be relatively simple to develop and administer, since the management agency would only have to be compensated

TABLE 57. ABBREVIATED INSTITUTIONAL OPTIONS FOR ON-SITE MANAGEMENT

Function	Option 1	Option 2
<u>Design/Installation</u>		
Site evaluation	Property owner/contractor	Management agency
System design	Property owner/contractor	Property owner or management agency ¹
Design review	Management agency	Management agency
Permit issuance	Management agency	Management agency
System installation	Property owner/contractor	Property owner or management agency ¹
Recordkeeping	Management agency	Management agency
<u>Operation and Maintenance</u>		
Routine maintenance	Property owner/contractor	Property owner or management agency ¹
Correction of failing systems	Property owner/contractor	Property owner or management agency ¹
Monitoring	Management agency	Management agency ¹
System ownership	Property owner	Property owner or management agency ¹

¹The management agency can provide these services through an agreement with a private contractor or through its own staff.

for the costs involved in reviewing system designs, issuing permits, and monitoring compliance with permit conditions. Program costs are typically raised through the general fund, permit fees, or other types of special assessments.

For option 2, on the other hand, a financing mechanism would be established to provide a method of raising revenues to cover system maintenance activities such as inspections and correction of failing systems. The system inspections could be provided by the management entity and paid by the property owner on a service fee basis, or the inspection service could be included (along with other management activities) as part of an annual payment to the management agency.

The management agency in option 2 could also assume responsibility for repairing or replacing septic systems. The management agency can set up a reserve fund that each property owner would pay into. If a wastewater system fails, the costs to repair or replace it is paid from the reserve fund. (This is similar in concept to an insurance program.) The reserve fund can be a completely separate fund or included as part of an annual payment that is designed to cover other management program costs.

The concept of a reserve fund to repair or replace failing septic systems has the distinct advantage of protecting the property owner from high, unplanned expenses for septic system replacement. This provision also gives the property owner an incentive to correct septic system problems without delay or financial worry.

The disadvantages of this concept rest with the potential for removing property owner incentives to properly care for the septic system. The likely attitude of the property owner may be to shift complete responsibility for septic system maintenance and performance to the management agency, which is collecting an annual payment for septic system services. The property owner, therefore, assumes no responsibility or liability for system performance. Another problem with the reserve fund approach is the difficulty of administering it in an area with existing septic systems. Inspections would be required to determine the operating condition of each septic system before a property owner to determine eligibility in the program.

Issues such as property owner attitude and equity in user rates should be evaluated before a financing mechanism is selected. Several examples of financing approaches applied in various on-site system management programs follow.

ON-SITE SYSTEMS FINANCING ILLUSTRATION

A typical fee for processing an on-site system permit application ranges from less than \$50 to over \$200. The on-site specialists in Vermont, for example, charge \$50 per lot to perform site evaluations, prepare system designs, and supervise system installation. In Marin County, California, the County Public Works Department has a \$200 per lot permit application fee which covers the cost of plan review and installation supervision. (The county does not perform extensive site evaluations in each lot application.)

Vermont appropriations to the on-site specialists program have helped keep the costs to a reasonable level and attractive to home builders in this rural state. Program directors estimate that the \$50 permit fee only covers half the cost of the program administration.

The Pennsylvania Department of Environmental Resources supports half the costs of the Sewage Enforcement Officer (SEO), a certified representative of the state who administers the state code. The other half of the SEO's salary is provided by a local unit of government (primarily townships), which uses permit application fees as a means of raising the local matching share.

The financial structure of the Fairfax County, Virginia, Health Department illustrates an alternative financing arrangement for local regulatory programs. The State Health Department pays the salaries of the county sanitarians, plan reviewers, and field personnel, which support about half of the county budget for this program. The remainder of the costs are covered by the County General Fund, and permit fees are collected to raise part of the county's revenue share. (The permit fee for an on-site system in the county is \$65 per lot.)

The financing methods used in the Georgetown Divide Public Utility District (GDPUD) in El Dorado County, California, and the Stinson Beach County Water District (SBCWD) in Marin County, California, illustrate the use of user charges to support on-site systems management programs. Both programs provide for the review of proposed new system design and the inspection of operating systems.

ON-SITE SYSTEMS FINANCING ILLUSTRATION ILLUSTRATION (CONTINUED)

In the GDPUD, an annual service charge of about \$15 is assessed toward every lot in the service area. The service charge is collected bi-monthly with the water bills. A special assessment of \$50 is paid by the developer once a home is sold. This fee is used to conduct wastewater facility studies within the service area. A \$10 permit fee is charged to each on-site system applicant. The developer is also assisting the GDPUD by a special site evaluation study (conducted with CETA help).

The Stinson Beach County Water District (SBCWD) charges a permit fee of \$104 per year. The permit fee is levied only to developed lots within the service area (unlike the GDPUD approach). Billings are done on a quarterly basis in conjunction with water bills. Water service termination can be used by the SBCWD to enforce its regulations.

The SBCWD has received a two-year demonstration grant from the State Water Resources Control Board to subsidize a portion of the operation and maintenance expense. The state has also provided SBCWD with funds for a \$100,000 revolving loan account for homeowners (with low income) whose systems need repair or replacement.

In recognition of the problems regulatory agencies face in requiring a homeowner to repair or replace a failing on-site system, the State of Wisconsin has set up a special revolving loan fund (of \$1 million) to provide funds to residents (via county regulatory agencies) for individual system repair and replacement. This program, in addition to the SBCWD revolving fund, is one of the few examples of financing incentives for individual system rehabilitation and repair.

INSTITUTIONAL OPTIONS FOR FINANCING SMALL COMMUNITY SYSTEMS

There are various approaches to financing the capital expenses and operating costs for small community systems, as presented in Tables 53 and 54. They are:

1. Service fees and charges to raise funds for capital and operation cost recovery.
2. Special benefit assessments or connection charges to cover initial capital expenses.
3. Reserve funds (such as a sinking fund) for future capital improvements.
4. Debt financing through loans and the issuance of bonds for capital cost recovery.

The choice of the precise financing arrangement will again depend on the management agency structure, and the assignment of ownership-operational responsibility. As described in Chapter 4, "Formulating an Operations Plan," there are several options available for owning and operating the collection and treatment systems. These systems can be owned, built, and operated by a single management entity, or by different entities. For gravity sewers, the ownership of the collector lines has traditionally extended to the private property line, and the cost of connecting to the street collector line was the responsibility of the property owner. For some forms of small community systems, particularly where STEP, grinder pump, vacuum or other pumping units are connected to a common pressure line, a wide variety of ownership/maintenance responsibilities can be established.

These alternative arrangements, with their associated financing implications, are outlined as follows:

1. The management entity would design, build, and operate the entire collection system (including the individual units) and treatment-disposal facilities. A financing mechanism would be established to cover amortization and operating costs.
2. The management agency would design and maintain the system. The property owner would purchase the unit from the management agency (via connection fees), and install it to agency specifications. The management agency would establish a

financing strategy that would cover debt service and operation and maintenance (including equipment replacement) for the entire system.

3. The unit would be designed and purchased by the management agency, then repurchased by the property owner. The property owner would then install and maintain the unit through special service contracts with private firms. Costs for system repair and replacement would also rest with the property owner.

4. The unit would be designed and built by the management agency, but maintenance and repair of the unit would rest with the property owner.

5. The unit may be owned, installed, and operated by the management agency, but would be purchased by the property owner (via connection fees).

Each option treats the individual residences equally. Together they offer considerable flexibility in allocating costs to individual homeowners. They also provide methods for reducing the local share of capital costs and operating expenses to the management agency. In the first two options, for example, the management agency can establish a uniform annual payment to cover its program commitments, or it may utilize an annual charge plus a service fee for mandatory inspections.

The socioeconomic characteristics of users should be considered in establishing a financing mechanism to reduce potential adverse economic impacts among various classes of users (see Table 54). Two examples of small community system financing programs are given here.

SMALL COMMUNITY FINANCING ILLUSTRATION

The Lake Meade Municipal Authority (LMMA), Lake Meade, Pennsylvania, has instituted a typical user charge system which relies on an annual service charge, connection charges, and special assessments to finance their small community system. The local share of the construction funds (about \$600,000) for the grinder pump/pressure sewer system and treatment plant were

SMALL COMMUNITY FINANCING ILLUSTRATION (CONTINUED)

raised by issuing a special assessment (\$950 per home) and a connection charge (\$1,750 per home). The assessment was designed to reflect the improvement in property values in the community due to the provision of a sewerage system. The connection fee represents the cost of installing the grinder pump/pressure sewer connection to the individual home. A \$268 sewer rental fee (service fee) to cover operation and maintenance is charged each homeowner connected to the system. The LMMA has the power to terminate wastewater service if homeowners are delinquent in making payments. The LMMA also owns the pumps, pressure lines, and the treatment plant.

The General Development Utilities (GDU) owns and operates a septic tank effluent pump (STEP) pressure sewer system serving a small portion of its service area in southern Florida. The monthly charge (of about \$8.00) and connection charge (\$700 per home) is the same for residents in the STEP system as it is for residents served by conventional gravity sewer systems. This method of assessing charges facilitates the billing procedures, but does not reflect the actual cost of servicing the residence or the pressure sewer system. GPU personnel are currently evaluating this service charge method and are considering a separate billing schedule for residents on the STEP system.

INSTITUTIONAL OPTIONS FOR FINANCING RESIDUALS DISPOSAL

The costs for transporting, treating, and disposing of residual wastes (e.g., septage) can be raised through service charges (corresponding to a pumping and treatment event), general property tax revenues, or annual payments (on a pro-rated basis). The selection of the appropriate financing arrangement will depend on:

1. Who owns and operates the transport vehicles.
2. Who owns and operates the treatment and disposal facility.
3. Whether septage pumping is mandatory (i.e., within a formalized on-site system management program) or voluntary (i.e., at the homeowner's discretion).

As discussed in Chapter 4 ("Institutional Options -- Residuals Disposal" section), septage transport vehicles can be owned and operated by either a public management entity or a private contractor. Septage treatment and disposal facilities can be similarly owned and operated by a public management entity or private contractor.

Financing arrangements for privately-owned transport and treatment facilities are relatively straightforward; costs for disposal site operation and residuals transport are funded through fees paid by those contracting for the services. These service fees, paid at the time of septage pumping, are normally set by the private contractor to cover capital investment and operating costs, and provide a profit.

Financing the costs of a publicly-owned septage facility and transport vehicles can be done in a number of ways. Special septage disposal facilities designed to treat or stabilize septage (so that it can be safely disposed of in a landfill) are eligible for EPA construction grants, as are septage hauling trucks. Financing the local share and operating costs of such facilities can be accomplished by using service fees, property taxes, and annual payments.

Several alternative financing scenarios for residual disposal transport and treatment facilities follow. Some of the alternatives involve the use of a manifest system (i.e., trip ticket arrangement), as illustrated in Figure 11. The first six scenarios describe situations where the treatment facility is publicly-owned; the final two scenarios involve the

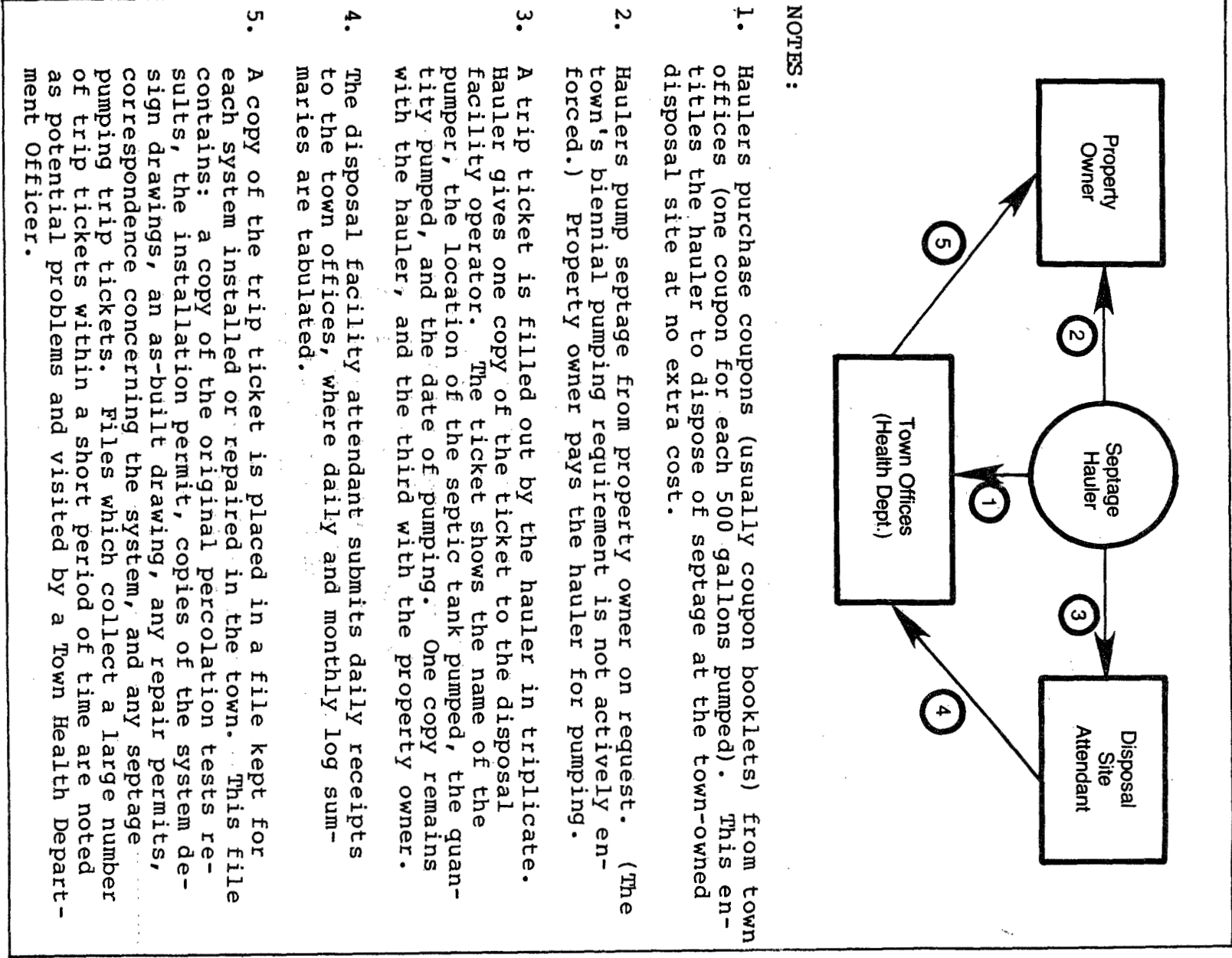


Figure 11. Septage management system for Acton, Massachusetts.

use of privately-owned and operated treatment facilities. In most of these scenarios, the hauler vehicle would be privately-owned and operated.

1. The costs of septage treatment are paid through the general fund (i.e., property tax revenues) of the management agency. Septage pumping is provided by public as well as private haulers. Every property owner within the jurisdiction would be offered one free or nominally-priced pumping during each specified period (e.g., 2 to 4 years).
2. The management agency would charge an annual fee to each homeowner with an on-site system to cover the costs of septage treatment (and possibly pumping if septage vehicles were publicly-owned or if a contractual agreement were established with a private hauler). The annual fee would be pro-rated on the basis of an average interval between pumping (e.g., every three years).
3. A manifest system is established to identify the origin of the waste and disposal site utilized. The property owner would purchase a ticket or coupon from the management agency to cover the costs of septage treatment at publicly-owned treatment facilities. The property owner would pay a hauler for the pumping and transport costs. The hauler could present the ticket at the disposal site.
4. Using a manifest system, the property owner would pay a hauler for pumping and transport. The management agency (i.e., owner and operator of the treatment facility) would bill the homeowner directly to finance the costs of septage treatment. A copy of a completed ticket will be left by the hauler with the treatment facility attendant to serve as proof of a pumping event.
5. The property owner would pay the hauler for service and treatment. The hauler would be allowed to utilize a publicly-owned treatment facility by presenting a prepaid ticket (purchased from the management agency) to the treatment facility attendant.
6. Same as above, except the hauler would be billed directly by the management entity, thereby eliminating the need for a prepaid ticket.

7. The hauler vehicles and treatment facilities would be privately-owned and operated. A single fee would serve to pay for pumping, transport, and disposal costs at the time of pumping.

8. Same as above, except that private haulers could contract with individual property owners (or with a sponsoring entity, e.g., on-site management district or property owners' association), and charge an annual fee for system inspections, septage pumping (and possibly system repairs) on a pro-rated basis.

Of the choices presented, there is no single "best option" that a community can adopt. Each scenario has its unique advantages and disadvantages. It is necessary to evaluate the relative merits and drawbacks of each scenario as they apply to a particular situation. Evaluation criteria that should be considered include:

1. Costs of administering the approach (including cost of public sector involvement in pumping and hauling activities).
2. Willingness of available private haulers to participate in a septage management program (especially one utilizing a manifest system).
3. Incidence of cost among users (e.g., are all residents contributing the same toward financing septage treatment facilities, or are only those utilizing the facility paying).
4. Need for a manifest system as part of an overall on-site system management program.
5. Ability of the management entity to adequately collect user fees.
6. Impact on regulatory program caused by frequent pumping, rather than repair of marginal systems.

Most importantly, the specific financing and organizational arrangement for septage transport and disposal should be consistent and compatible with related wastewater management objectives.

Several examples of financing arrangements applied in residuals management programs follow.

RESIDUAL DISPOSAL FINANCING ILLUSTRATION

Financing costs for residuals disposal can be accomplished in a number of ways. The most popular fee structure is a flat fee or a per gallon fee set to cover the costs of pumping, transport treatment, and disposal. The Town of Acton, Massachusetts, utilizes a prepaid coupon method of collecting fees for septage treatment. This is a common method used by public agencies to recover septage treatment costs for wastes hauled by private contractors. A single coupon, purchased by the hauler for \$5, covers the cost of treating 1,000 gallons of septage (or an amount of wastes pumped from a single residential unit). Haulers purchase the coupons from the Town Clerk and present them to the treatment facility attendant (along with information specifying the origin of the wastes). The hauler then charges the homeowner an amount sufficient to cover the costs of pumping, transport, and the fixed fee paid for septage treatment. The average cost for septage hauling in Acton is about \$50 to \$60 per pumping.

The Fairfax County, Virginia, Department of Public Works currently charges an annual license fee of \$400 per hauling company. The license fee entitles the hauler to dispose of septage wastes at one of two county-owned and operated wastewater treatment facilities. The revenue derived from the license fees is applied to financing the costs for treatment facility operation and maintenance.

Santa Cruz County, California, has instituted a user charge system which provides periodic system inspection and septic tank pumping. The County Health Department administers the program for two separate on-site management districts in the county. The service charge of \$25 per year levied by the Health Department covers the costs of periodic inspections (performed by a private contractor), plus septic tank pumping. Because of the difficulty of finding accessible septage disposal sites and the rising costs of septage treatment in that region, the county is considering a modification to its service charge by removing the pro-rated charge for tank pumping.